Graduate Student Residence

Oklahoma State University

PROGRAM

Bill Cheeseman

This report is submitted in partial
fulfillment of the requirements for the
Master's Degree in Architecture
at Oklahoma State University.

Acknowledgements

I wish to thank Alan Brunken for his great patience, Bob Heatly for his guidance, Pat Hofler for his interest, Tiny's Cafe for a good breakfast, and Charles Harrington for the climate information.

Special thanks to Barbara Sandmeyer for the flawless typing. The transfer lettering and grammatical mistakes are those of the author.

BC
13 Jan 1980

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INTRODUCTION

Background

Oklahoma State University has provided housing for its students since its establishment. Currently, 7000 single students, representing 30% of the total student population, live in residence halls on campus. Residence halls are under the administration of the Single Student Housing Office, a university-created corporation. In addition, Oklahoma State provides 710* apartments for married students and their families, through the Married Student Housing Office.

However, OSU lacks student housing which satisfies the particular needs of single graduate students. Single grad- and veterinary medicine students number approximately 1660, a figure expected to be rather stable in the foreseeable future.

*This number represents the remaining married student apartment units, after the removal of 109 apartment units from the graduate dormitory site.

Currently, graduate students who choose to live in residence halls must adhere to the same regulations concerning visitation hours as do incoming freshmen. In a recent survey taken by the Single Student Housing Office, graduate students voiced a desire to be exposed to a more stimulating dormitory environment. Considering the fact that a graduate student already holds a baccalaureate degree, is older, and may be foreign, it is not unreasonable that he desires a different environment than the one offered to and created by freshmen students.

The project for which this program report is written is a residence for graduate students for Oklahoma State University. The goals for the project are stated hereinafter, but perhaps a word on the International House concept is in order. The idea began in New York in the early part of this century, with a building dedicated to the promotion of peace and international brotherhood through cooperative living and mutual exchange of cultural knowledge. Many International Houses now exist throughout the world, each functioning independently. They have been de-

scribed as live-in student unions for students of all nations. While this project does not necessarily have to produce an "International House," it is felt that mention of the idea and its functional validity should be made.

Work Performed

This program report results from the gathering and processing of data, the establishing of goals and their validity by testing concepts, the determination of needs, and the statement of the problem. This general summary of the programming process does not begin to acknowledge the actual amounts of time and work involved. The programming system used here is discussed at length in Problem Seeking, An Architectural Programming Primer, by William Pena.

The Client

The client for this project is Mr. Pat Hofler, acting Vice-President for Student Affairs, 201 Whitehurst, Oklahoma State University, and is in charge of all student housing on the university campus. The operation of the graduate dormitory will be

managed through the Single Student Housing Office, under the control of the Student Services Office.

Mr. Hofler is concerned that the graduate facility is designed with strict attention to costs, from construction through use. He is concerned with life-cycle analysis as a test of the validity of design decisions. He wants to assure that the maintenance needs of the facility are minimized and that residents are given maximum opportunity to assume responsibility for their own living quarters. Although the area near the site for the new dormitory has little or no vandalism problem, reasonable security for the facility is of concern to the client.

Mr. Hofler feels that energy conservation is important and wishes to see the graduate facility serve as a demonstration of new opportunities for energy conscious design in student residences.

Participating Information Groups

Office for Institutional Research
301 Whitehurst Hall Ph. 624-6897
Oklahoma State University

Graduate College
202 Whitehurst Hall Ph. 624-6368
OSU

Office of the Registrar
1st Floor, Whitehurst Hall Ph. 624-6857
OSU

Architectural Services, Const. Files and Printing
Architectural Services/Physical Plant Administration Building Ph. 624-7131
OSU

Married Student Housing
E-2 Brumley Ph. 624-5353
OSU

Single Student Housing
Housing Office, 2nd Floor, Student Union Ph. 624-5595
OSU

Organization of Report

This report is organized into two main parts. The first part, the program, consists of six subdivisions:

- GOALS
- FACTS
- CONCEPTS
- NEEDS
- PROBLEM STATEMENT

APPENDIX

This standard format is based on the five programmatic steps, which are the first five subdivisions here, along with an appendix containing some detailed data, with a short glossary of some words and terms used in the program report.

The second part of this report is to be made up of drawings, diagrams, and supporting calculations for a design solution for the graduate dormitory project. This second portion is to be completed at the end of the spring, 1980, academic semester, and may be incorporated with the program portion of the report, or may exist as a separate volume.

PROJECT GOALS

Mission

The graduate dormitory will be identified as a university center for international social activity and cultural affairs. Although it is to serve as a private residence, it is to be an important part of campus life. It should serve to introduce other university students to citizens of foreign countries and foreign students to American higher education.

Goals and Objectives

1. MAXIMUM NUMBER. To maximize the services for residents and guests. To accomodate the numerous large meetings and social affairs held in the facility.

2. INDIVIDUAL IDENTITY. To enable the resident to maintain his own identity within the greater numbers in the graduate dormitory.

3. INTERACTION/PRIVACY. To promote interaction of large groups as well as smaller groups, while still providing for personal recreation and privacy. X

4. HIERARCHY OF VALUES. To demonstrate a concern for users' needs, yet integrate architectural and structural design concepts, building systems, and principles of energy-conscious design. X

5. SECURITY. To allow students maximum opportunity to assume responsibility for their living quarters and the operation of the facility itself, yet provide for reasonable security. X

6. ENCOUNTERS. To facilitate unscheduled social encounters with other students as well as scheduled gatherings. X

7. SITE CONSIDERATION. To demonstrate a concern for climatic features of the site, to respond to annual and diurnal changes in weather.

8. DIRECTION. While still responding to its immediate neighbors, the building should direct itself to the campus proper as well.

9. ENTRY. To provide a sense of welcome and entry for all university students.

10. IMAGE. To serve as a demonstration of new opportunities for energy-conscious design in student residences.

11. MINIMIZE COSTS for maintenance and operation of environmental conditioning equipment and enable the facility to remain open year-round.

12. ESTABLISH A PRIORITY on the reduction of life-cycle costs of the facility.

Policies

FUNCTION. That all common areas and some resident living areas be accessible to the physically handicapped. That the dormitory be accessible to all modes of transportation available in Stillwater.

FORM. That brick be used as an exterior material.

ECONOMY/TIME. That the dormitory be economically self-supporting.

FACTS

According to the Office of Institutional Research, approximately 3500 graduate and veterinary medicine students will enroll each year through 1990. Of this number, approximately 1610 students would be unmarried. See Appendix for more tabulated information.

Staffing Requirements

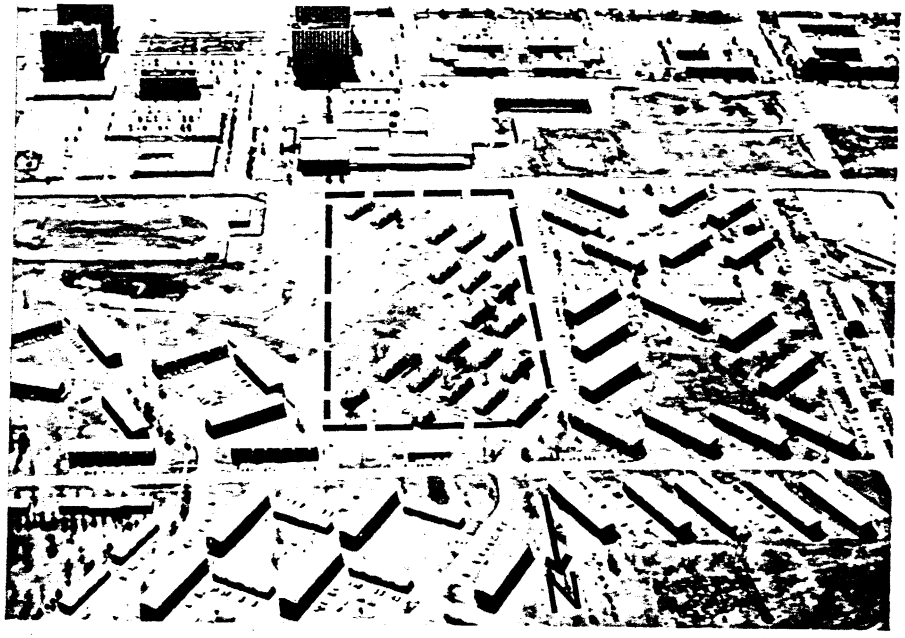
The graduate dormitory will utilize an administrative staff of 21, which will require office space for daily use during regular business hours. This staff would be composed of a program staff of 5 persons, an administrative office staff of 9, and a food service staff of 5 persons. As in other dormitories on campus, a resident advisor couple will live on the premises in a complete living unit.

Users

All residents are graduate students and attend classes full-time in the university in all fields of study. Of the 250 total student residents, equal numbers of men

and women can be assumed to live in the building and all facilities are to be co-educational. According to graduate college figures, the average length of stay would range from three semesters to two years. In the case of Veterinary Medicine students, the length of stay could reach four years. One-half to two-thirds of the total number of residents are American, while the rest are from foreign countries. All residents are unmarried.

In addition to the 250 student residents, there would be up to 10 transient guests and visitors. These guests might be the parents or friends of residents on an extended visit, or perhaps a speaker staying only for one night.



Aerial View

Site Analysis

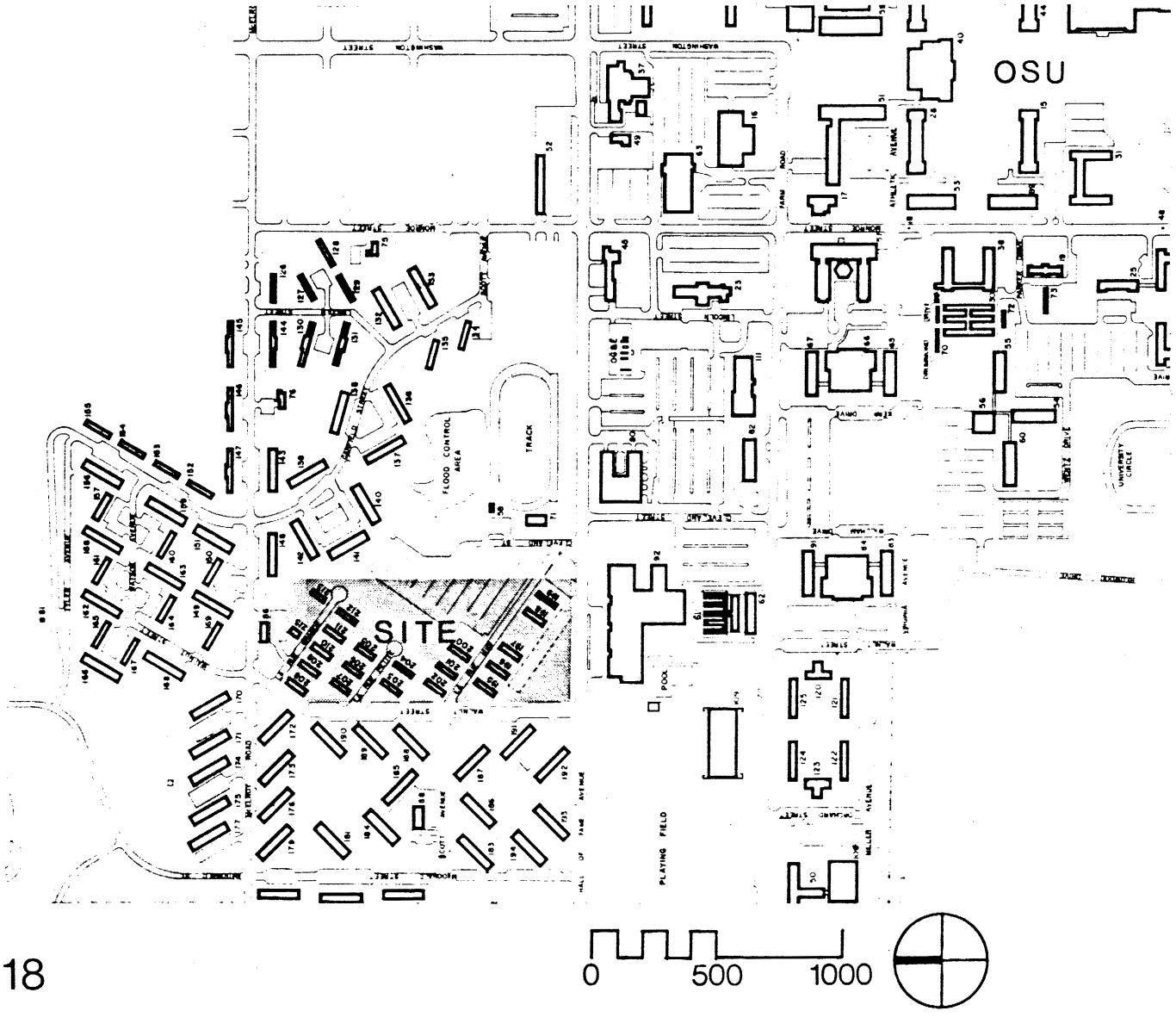
Context

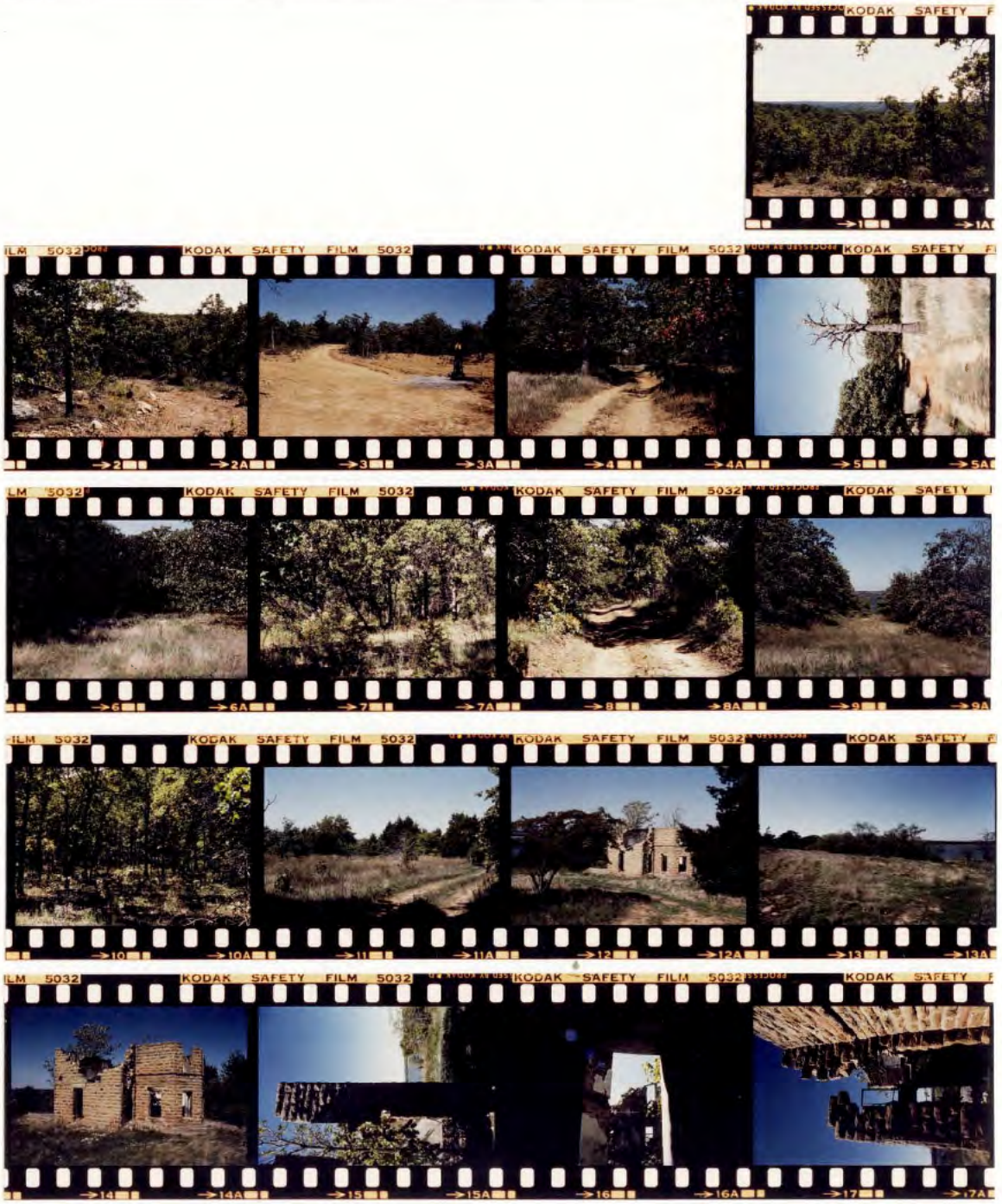
The site is located on the Oklahoma State University campus in Stillwater, Oklahoma. The main academic areas of the campus lie to the southeast. The context of the immediate area could be termed "apartment-complex suburban," and the surrounding apartments are the only university housing open year-round.

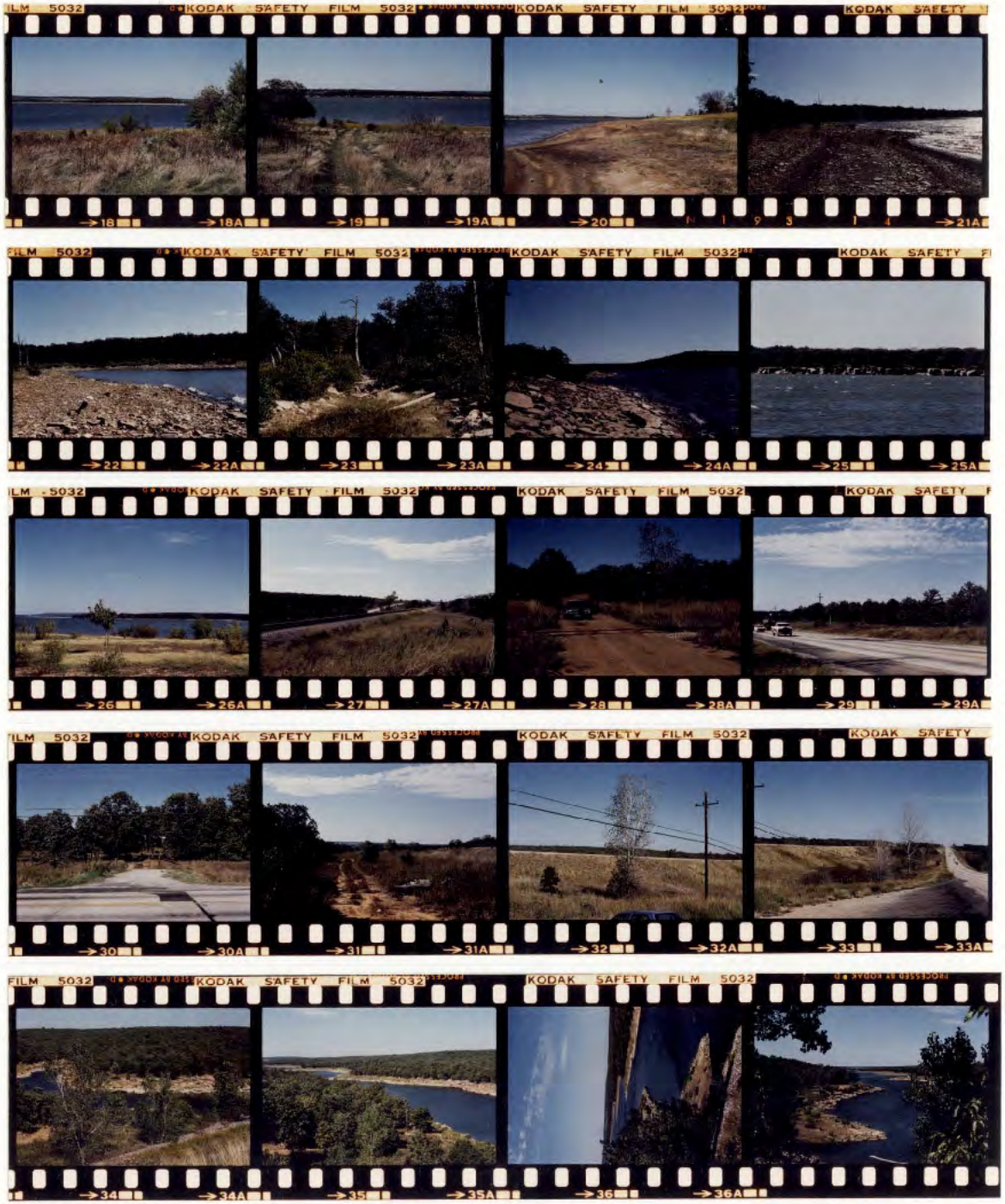
Vicinity Land Use

To the north of the site is a laundromat, and across McElroy Road are two-story brick married student apartment buildings. To the east are two-story married student housing, a gravel parking lot for 400 cars, and a running track with a small, brick storage building. To the sourth, directly across a four-lane street (Hall of Fame Avenue), is the Colvin Physical Education and Recreation center, a one-story brick building. West of the site, across Walnut Street, lies several more two-story brick married student apartment buildings. There are no adjacent buildings casting shadows on the site.

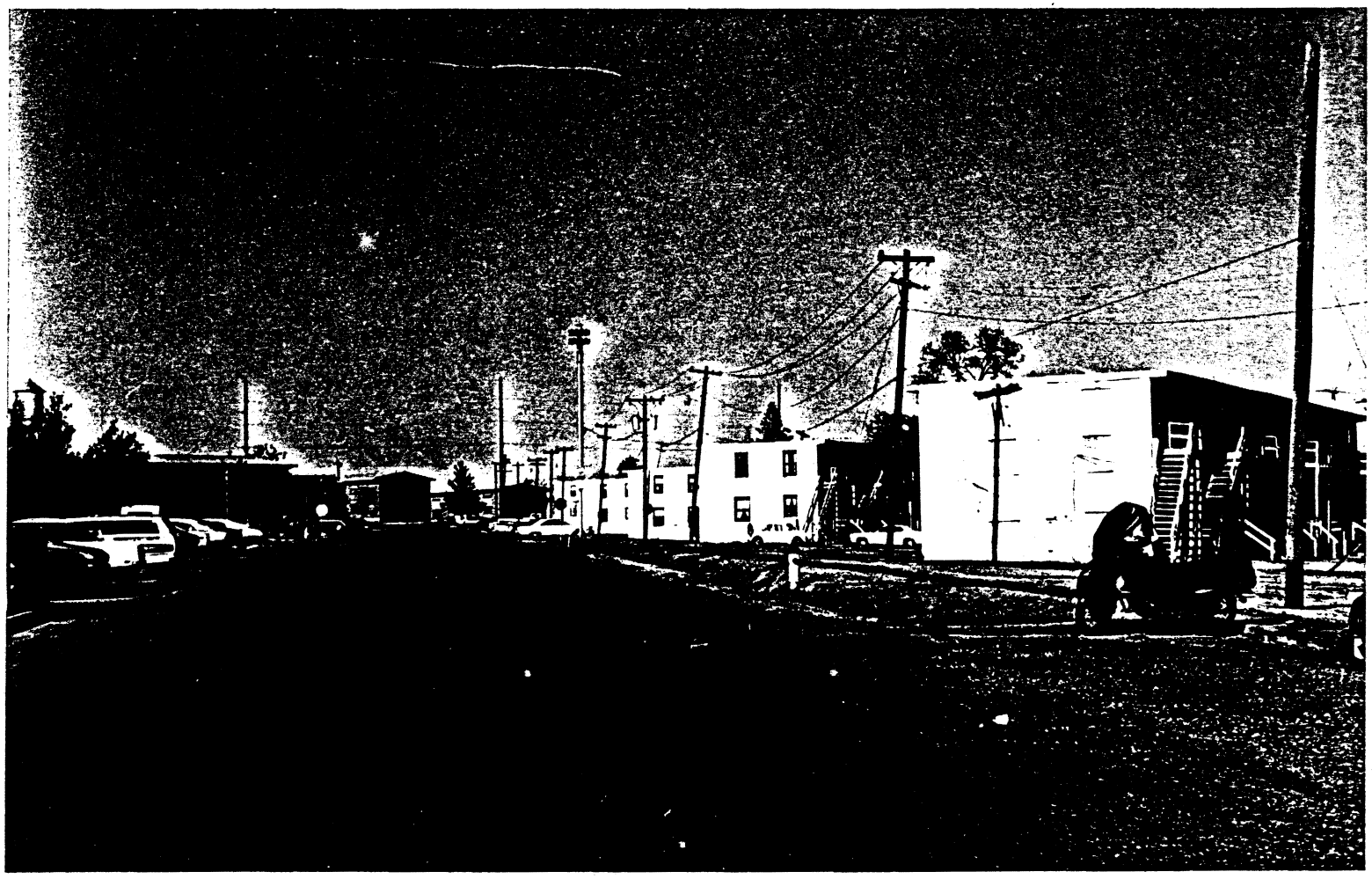
SITE CONTEXT




KODAK SAFETY FILM 5032

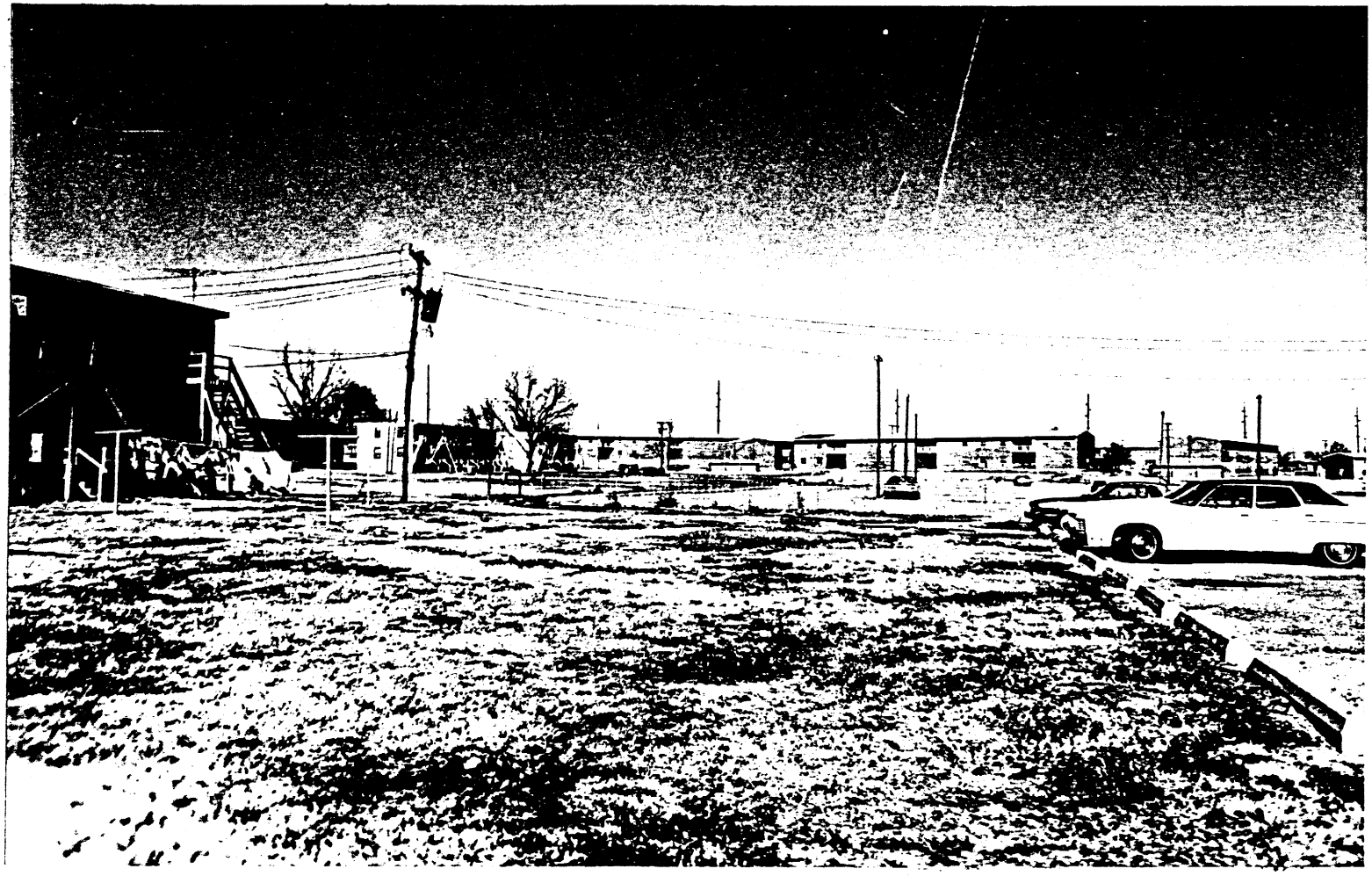

FILM 5032 KODAK SAFETY FILM 5032
→18 →18A →19 →19A →20 →21A
FILM 5032 KODAK SAFETY FILM 5032
→22 →22A →23 →23A →24 →24A →25 →25A
FILM 5032 KODAK SAFETY FILM 5032
→26 →26A →27 →27A →28 →28A →29 →29A
FILM 5032 KODAK SAFETY FILM 5032
→30 →30A →31 →31A →32 →32A →33 →33A
FILM 5032 KODAK SAFETY FILM 5032
→34 →34A →35 →35A →36 →36A

1.



2.

3.



4.

5.

Index to photographs

PHOTO 1
Walnut Street, looking north. The existing structures on the site are to the right. The upward slope of the street is 2%.

PHOTO 2
View to the east of the site. The parking lot may be altered to a new configuration as part of the project. Building at right is the running track building.

PHOTO 3
View to the north by northwest. Existing structures on the site are at left. The parking at center and at right may be altered.

PHOTO 4
Looking northwest along the gravel/asphalt road in the middle of the site. The brick Married Student Housing buildings at the center are at the upper end of a 6% slope.

PHOTO 5
View to the west. The Married Student Housing is across Walnut Street.

Topography and Catchment

Generally, the slope of the site is from the northwest to the southeast. Highest point on the site is 974 feet, at the extreme northwest corner. The lowest point on the site is 942 feet, at the extreme southeast corner. Due east of the site is a catchment basin, the lowest point of which is at 927 feet.

Tree Cover

There is very little tree cover on the site, with the few existing trees standing very much alone.

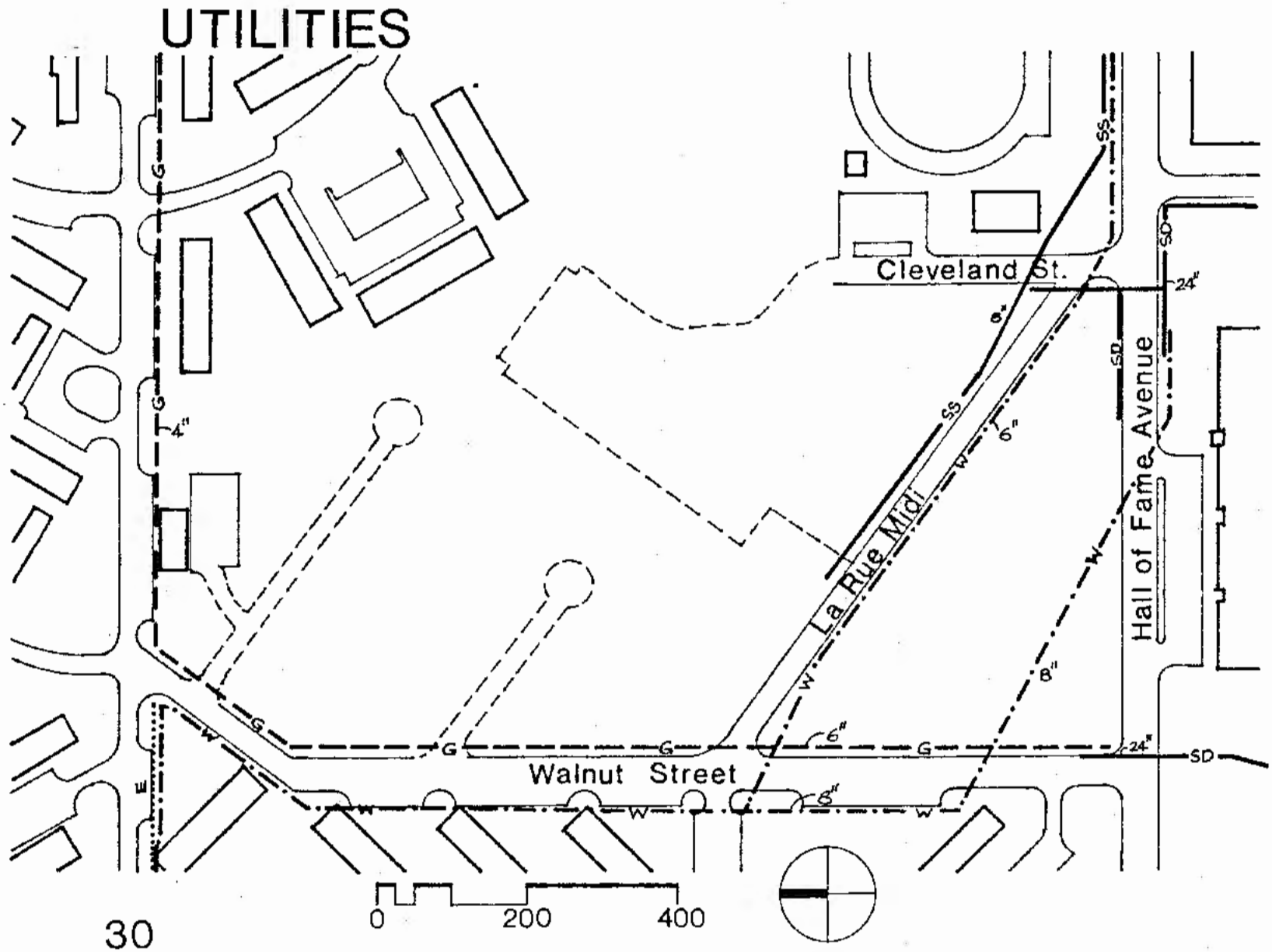
Buildable Areas

Except for easements along Hall of Fame Avenue and Walnut Street, virtually the entire site is buildable.

Existing Structures

Presently on the site are 21 wood frame two-story apartment buildings built on temporary foundations. All of these structures will be removed. Also on the site are

two short gravel streets ending in cul-de-sacs and one asphalt street, La Rue Midi. The gravel streets will be removed. The asphalt street and its easement containing a 6" water supply line may be retained, re-routed, or removed. Cleveland Street, which is just to the east of the site will be retained, as will the portion of the 400-car gravel parking lot not on the site. The portion of the gravel parking lot now on the site may be rearranged, changed to a new configuration, or retained as it is. This lot is used by residents of other dormitories on campus. Overhead telephone and power lines will be removed and will be replaced by underground lines, arranged in accordance to the design of the new facility.


UTILITIES
Cleveland St.
Hall of Fame Avenue
La Rue Midi
Walnut Street
SS
SD
G
W
E
4"
6"
8"
24"
0
200
400

Accessibility

The site is easily accessible from Walnut Street between Hall of Fame Avenue and McElroy Road. Presently, there is access to the site from Hall of Fame, via La Rue Midi and Cleveland Street.

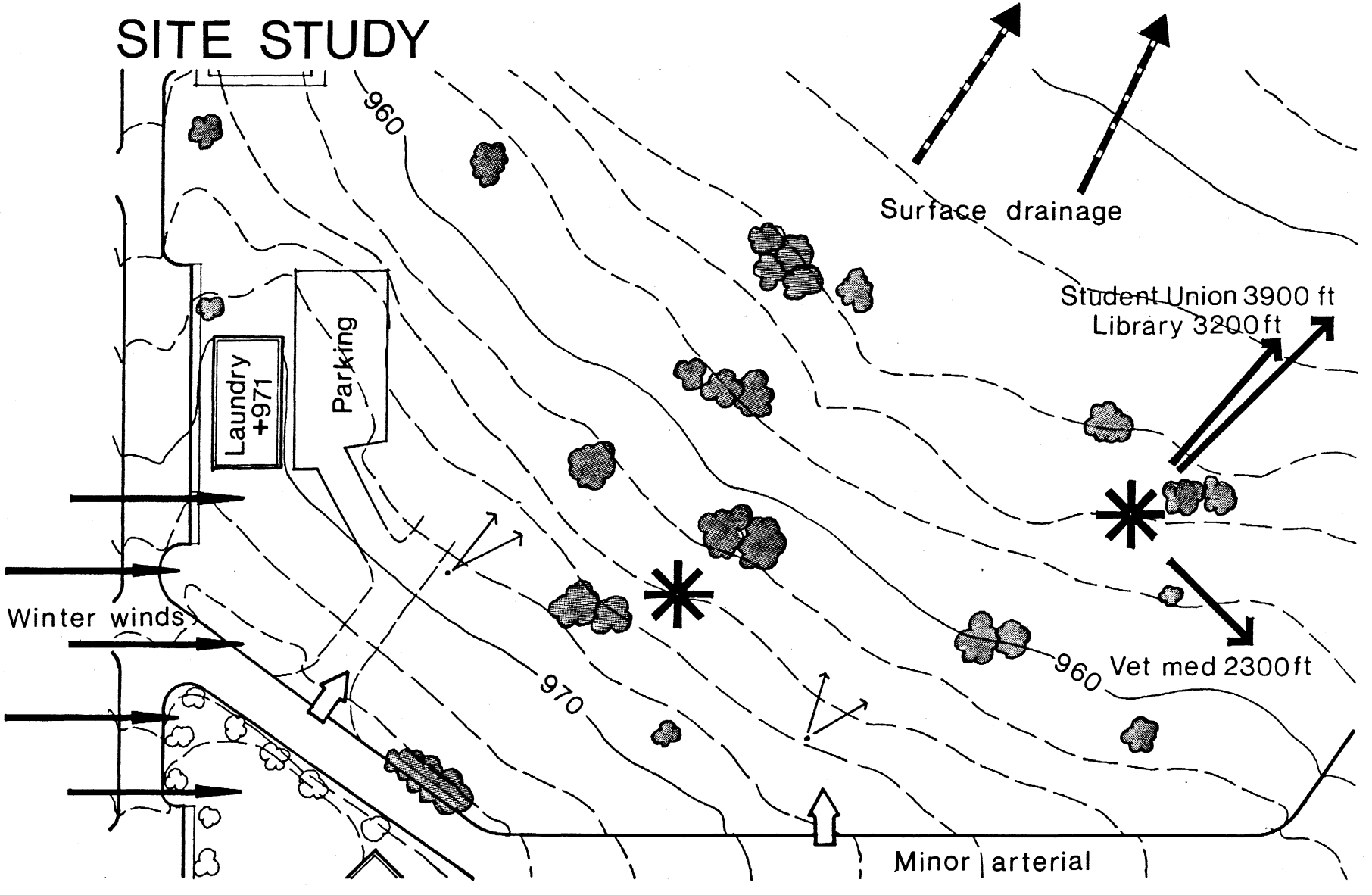
Walking Distances

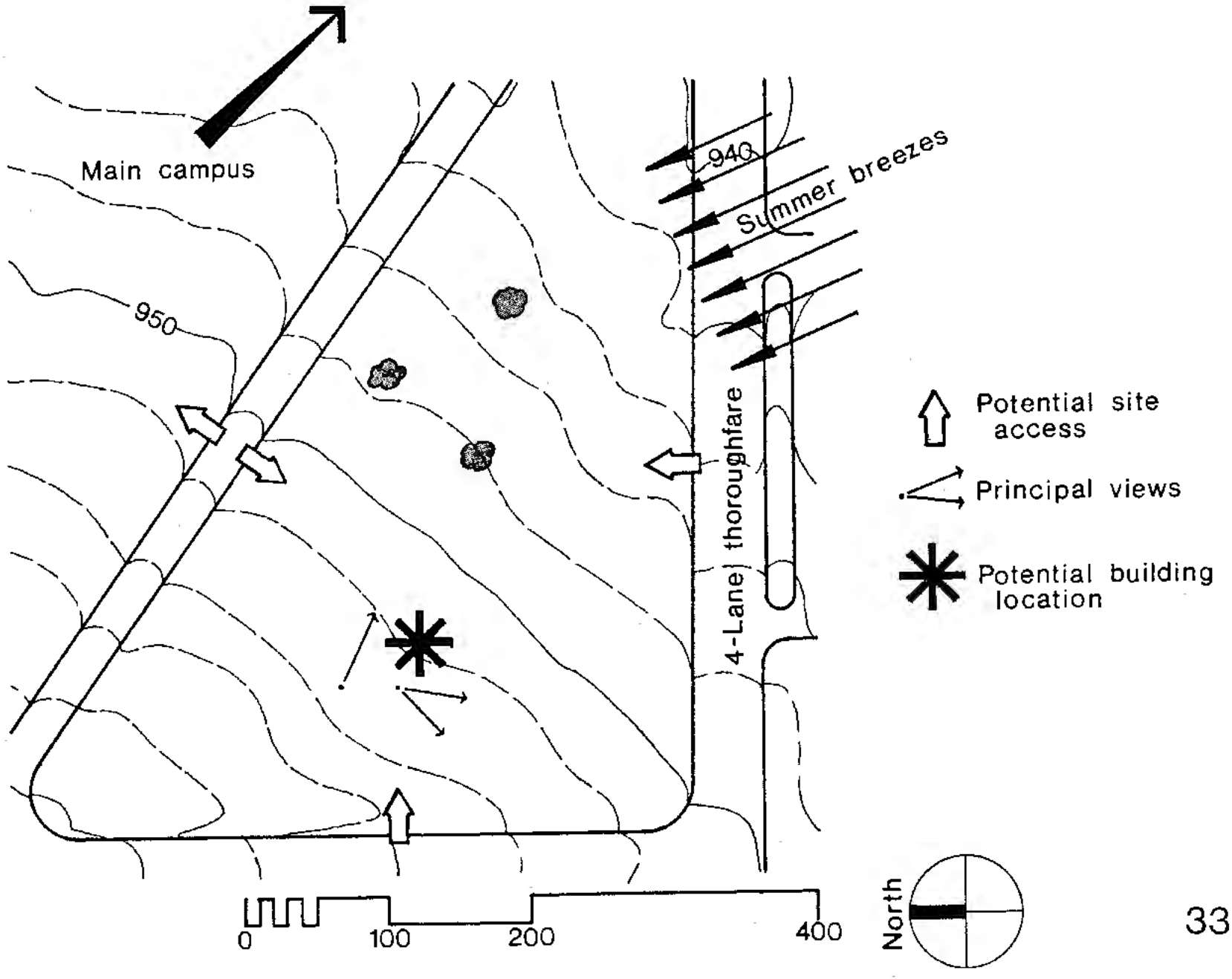
Distance from the middle of the site to the OSU Library is 3200 feet. The Student Union lies 600 feet from the Library. Most classroom buildings are within 3900 feet of the site. Most veterinarian school buildings are within 2300 feet of the site.

Traffic Volume

Hall of Fame Avenue can be expected to carry a light to medium volume of traffic during most periods and a very heavy volume on football Saturdays. A pedestrian crossing exists at the intersection of Hall of Fame and Cleveland Street, and is used primarily by students who use the overflow parking lot on the site.

SITE STUDY


960
Surface drainage
Student Union 3900 ft
Library 3200 ft
Laundry +971
Parking
Winter winds
970
960
Vet med 2300 ft
Minor arterial


Main campus
950
940
Summer breezes
4-Lane thoroughfare
Potential site access
Principal views
Potential building location
0
100
200
400
North

Climate Data

Design temperatures for Stillwater are as follows:

Winter	Design Dry-Bulb	
	99%	97.5%
	8	13

Summer	Design Dry-Bulb		
	1%	2.5%	5%
	100	96	93

	Design Wet-Bulb		
	1%	2.5%	5%
	77	76	75

Summer mean daily range is 24 degrees.

Source: ASHRAE 1977 Fundamentals Handbook

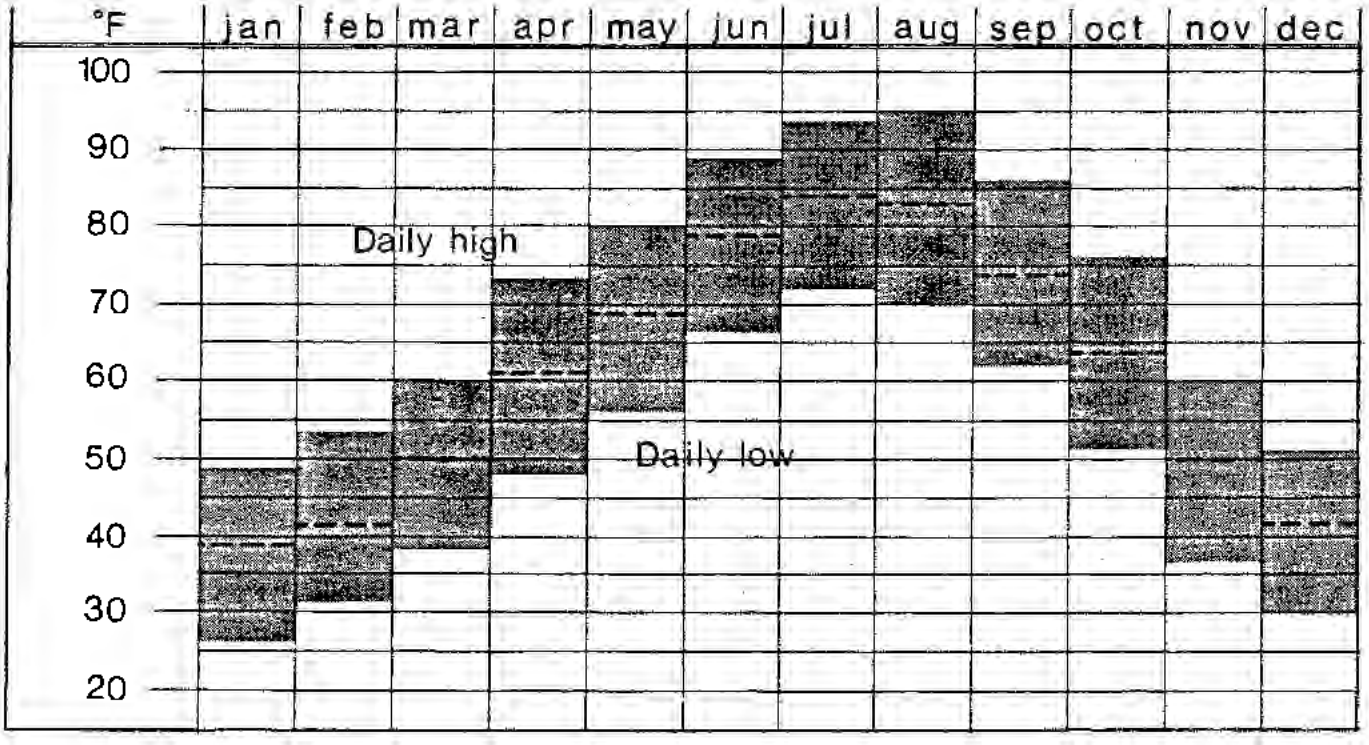
Average Monthly and Yearly Degree Days, Tulsa (Base 65)

Jan	893
Feb	683
Mar	539
Apr	213
May	47
Jun	0
Jul	0
Aug	0
Sep	18
Oct	158
Nov	522
Dec	787
Year	3860

Source: ASHRAE 1977 Fundamentals Handbook

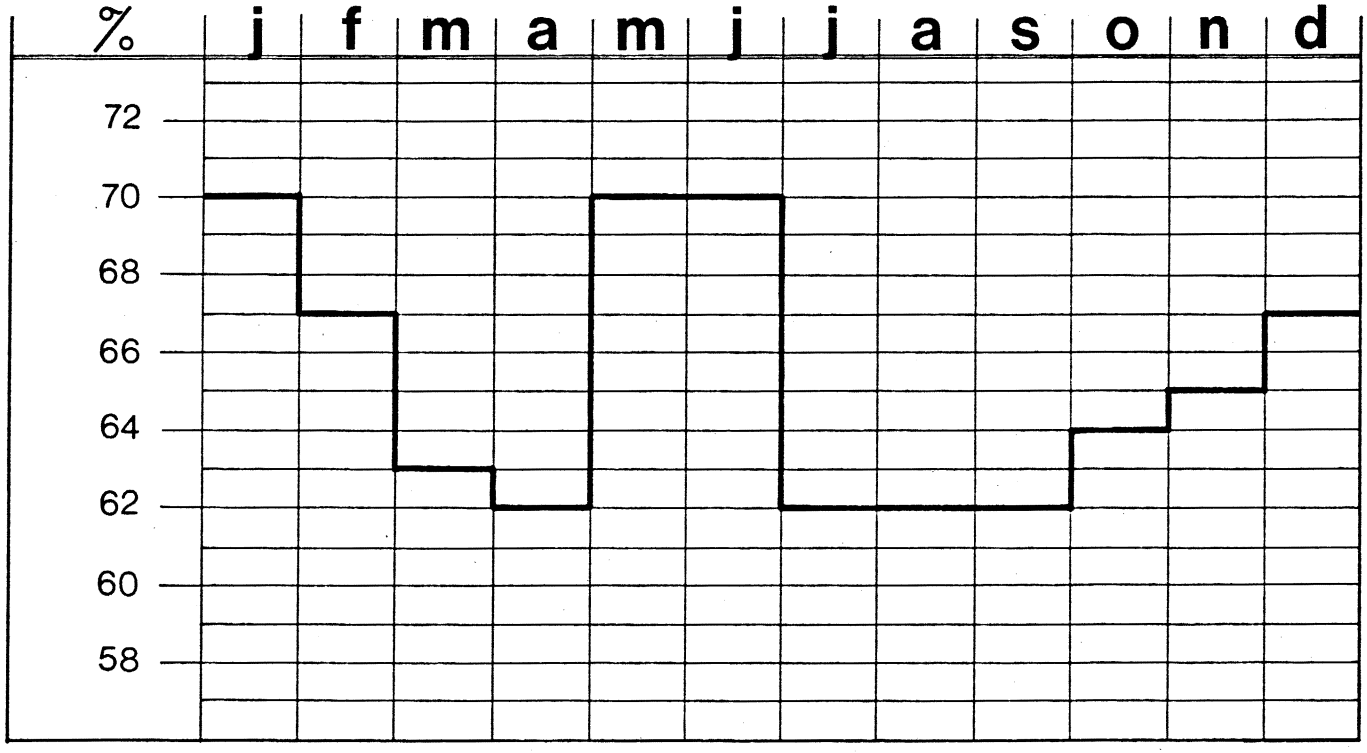
AVERAGE DAILY TEMPERATURES

SOURCE: WEATHER ATLAS OF
THE UNITED STATES

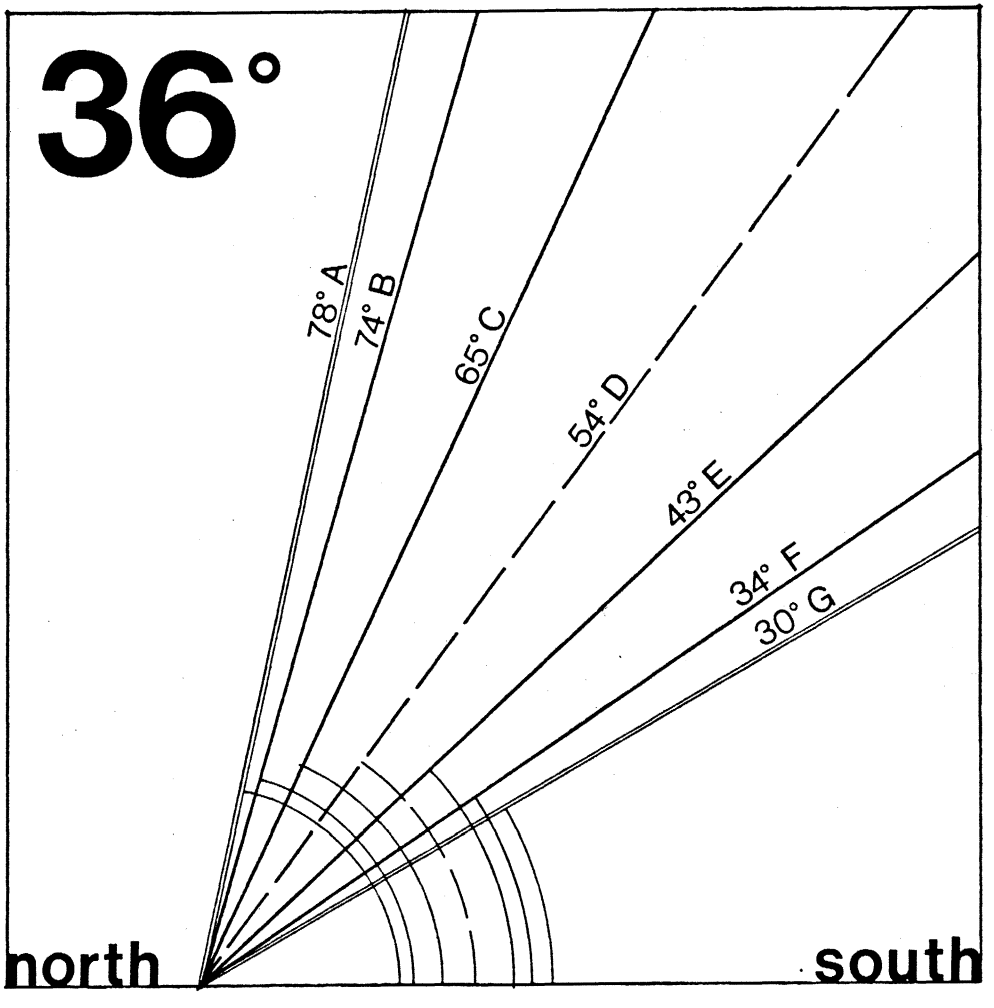


MEAN RELATIVE HUMIDITY

SOURCE: WEATHER ATLAS OF THE UNITED STATES

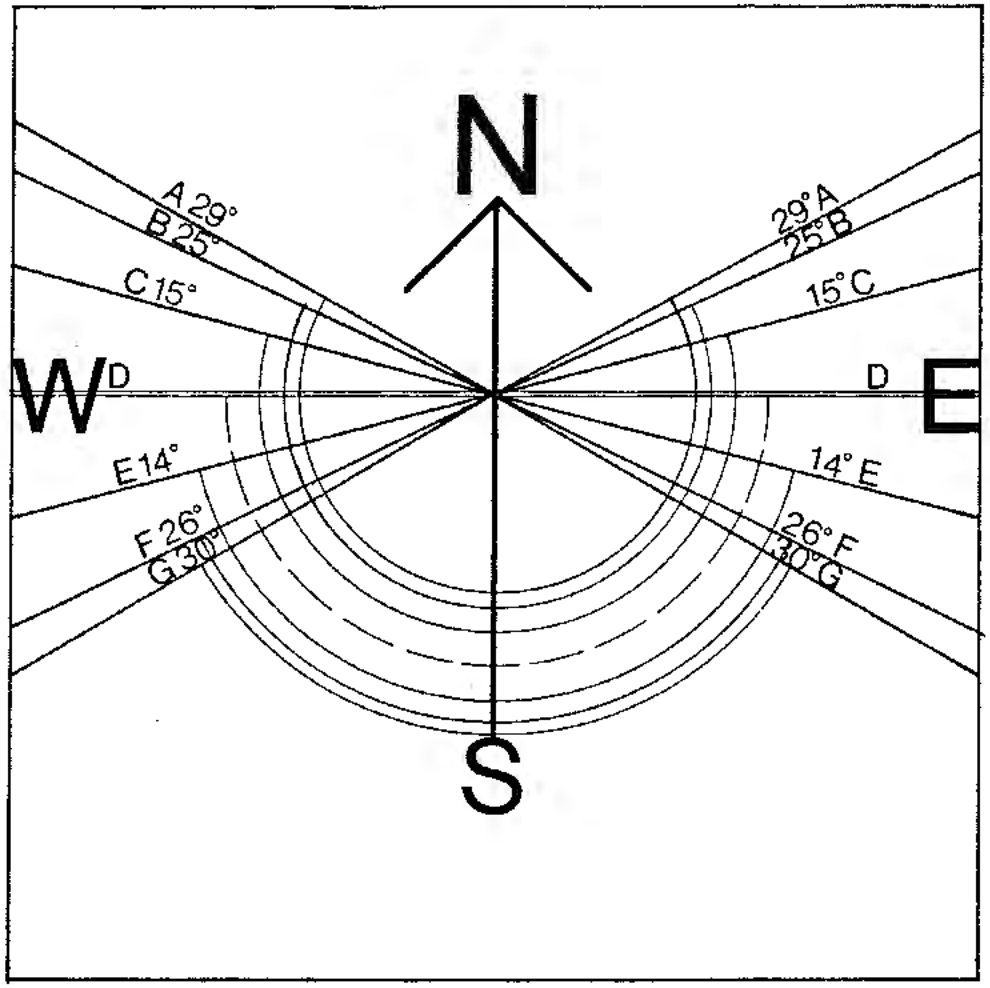


SOLAR ANGLES



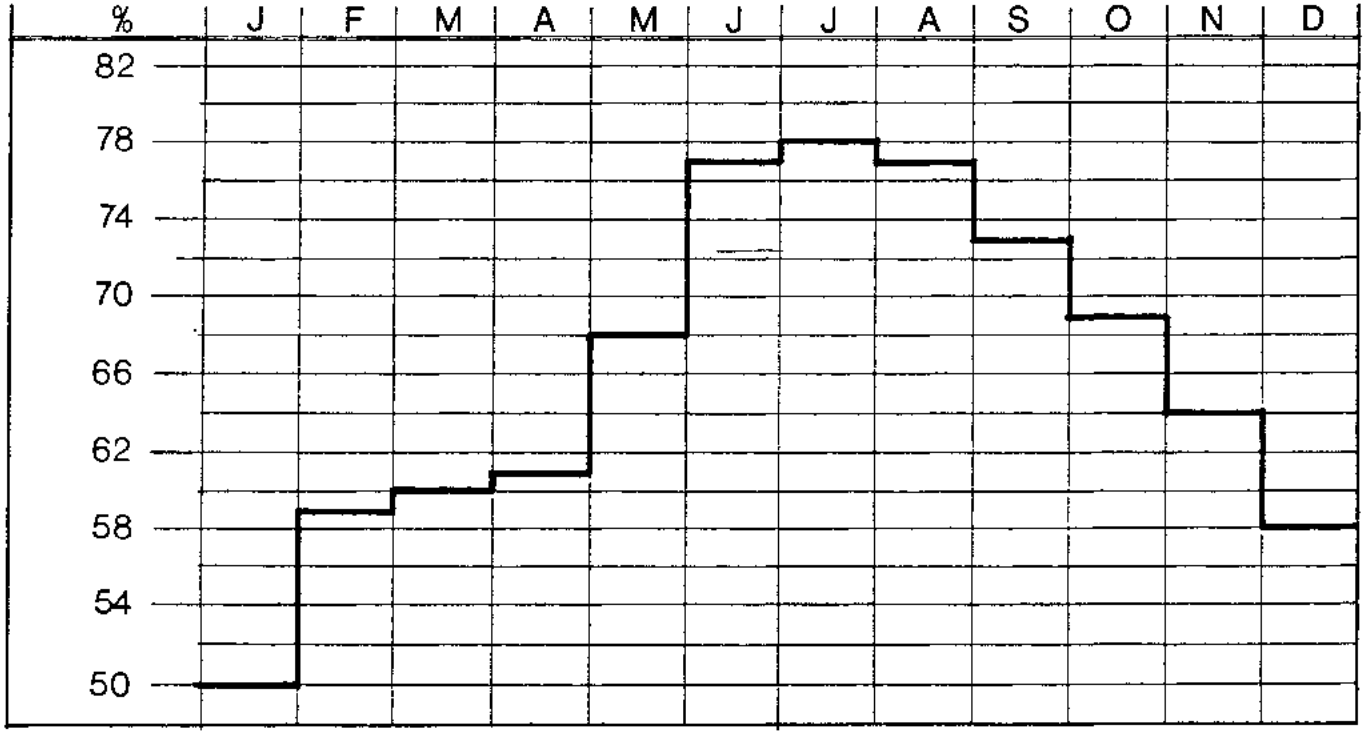
A. June 22
B. May 22-July 22
C. April 22-Aug. 22
D. March 22-Sept. 22
E. Feb. 22-Oct. 22
F. Jan. 22-Nov. 22
G. December 22

SUN PATH



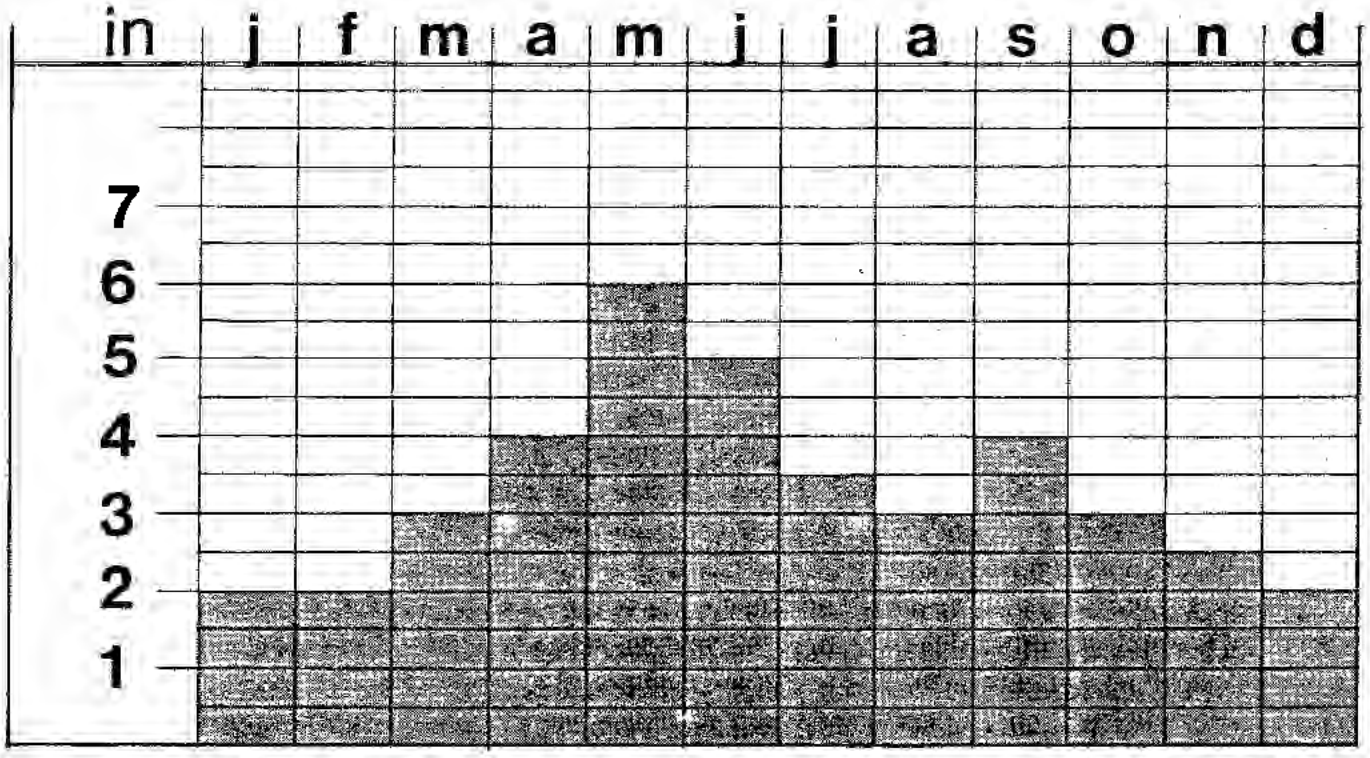
POSSIBILITY OF SUNSHINE

SOURCE: WEATHER ATLAS OF THE UNITED STATES



AVERAGE PRECIPITATION

SOURCE: WEATHER ATLAS OF
THE UNITED STATES



PREVAILING WIND

SOURCE: WEATHER ATLAS OF THE UNITED STATES

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Direction	s	s	n	nw	nw	nw	nw	nw	nw	nw	n	n
Avg. Speed	11	12	13	12	11	10	9	9	9	10	11	11

The previous lists and charts provide a basis on which schematics of the facility may begin. Detailed analysis of developed design would require much more information. References for further analysis would include the following:

Resources

- ASHRAE Fundamentals Handbook
- ASHRAE Systems Handbook
- ASHRAE Equipment Handbook
- McGuinness/Stein. Mechanical and Electrical Equipment for Buildings
- Stein. Architecture and Energy
- Olgyay. Design with Climate
- Lambeth. Solar Designing
- Davis/Schubert. Alternative Natural Energy Sources in Building Design

These and other references would include technical data concerning insolation, transmittance, conductance, time lag, and related information.

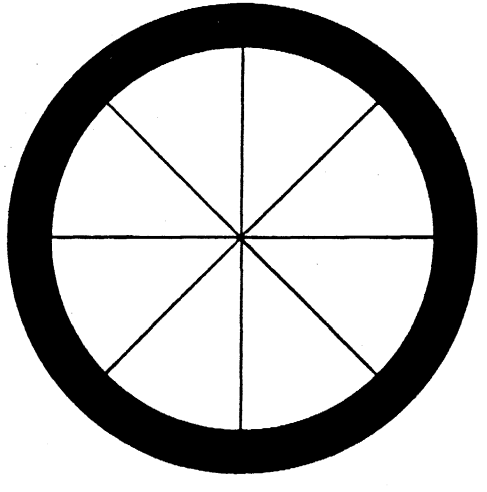
Codes

Applicable codes include the 1967 National Building Code and the NFPA 101 (Life Safety Code).

CONCEPTS

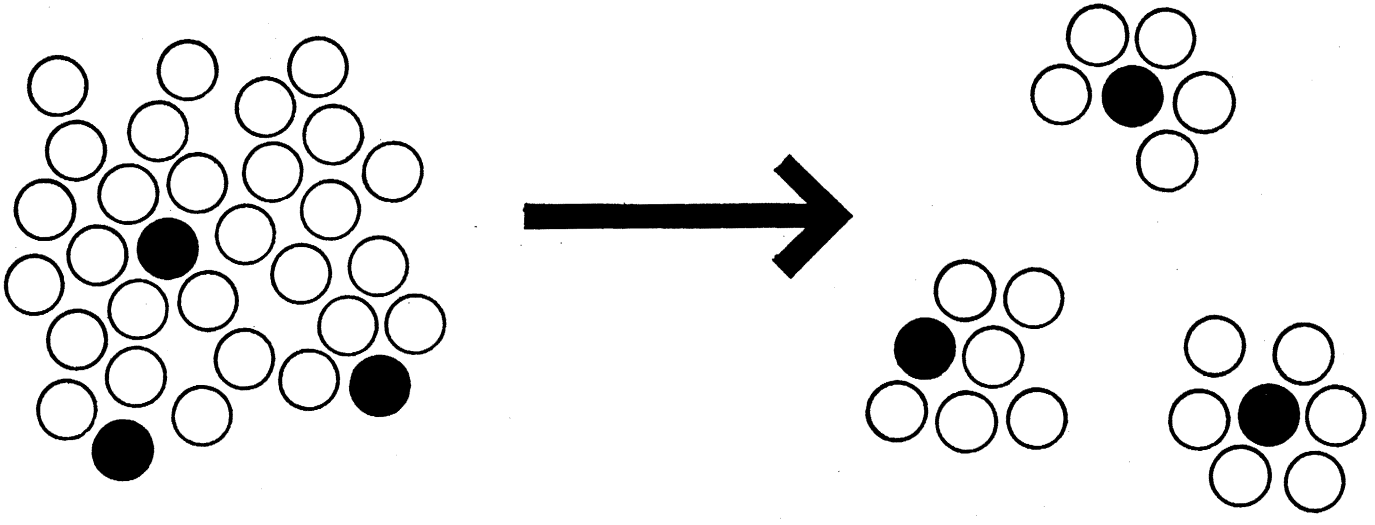
1. SERVICE GROUPING

CENTRALIZE RELATED SERVICE/SUPPORT AREAS.



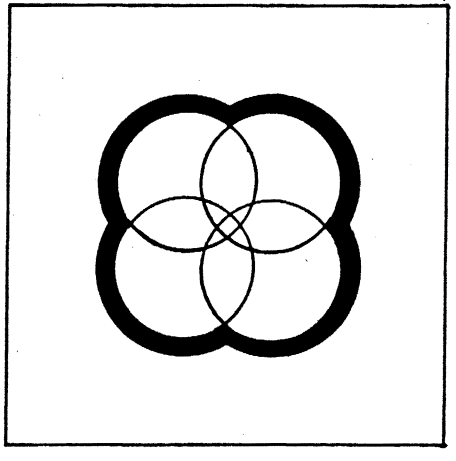
2. PEOPLE GROUPING

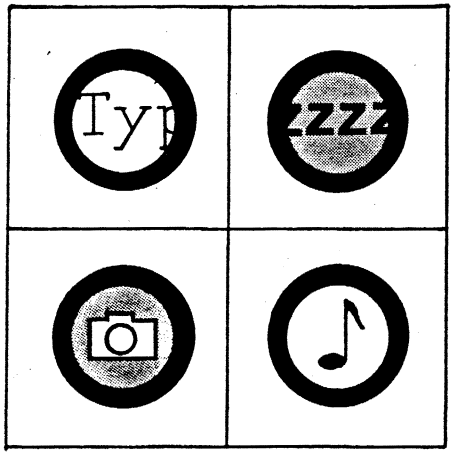
BREAK DOWN LARGE NUMBERS OF RESIDENTS INTO SMALLER LIVING AREA GROUPS, ALLOWING MORE PERSONAL EXPRESSION AND INTERACTION. ALLOW FOR PRIVACY IN INDIVIDUAL SLEEPING AREAS.



3. ACTIVITY GROUPING

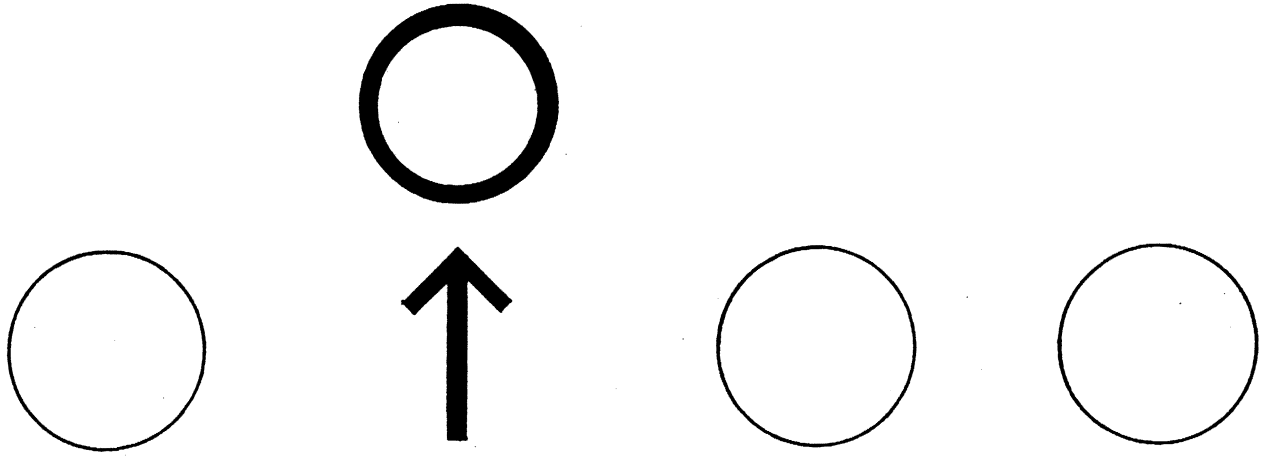
INTEGRATE COMMON AREAS TO PROVIDE FOR GROUP INTERACTION. COMPARTMENTALIZE SPACES IN WHICH VISUAL OR AUDIO PRIVACY IS REQUIRED.





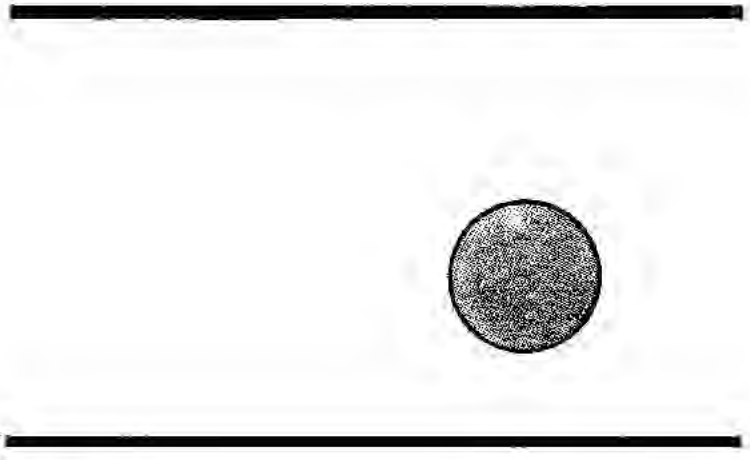
4. PRIORITY

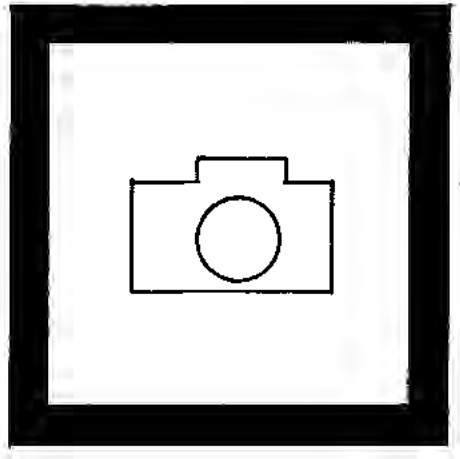
ARRANGE SPACES AND ACTIVITIES TO SUIT FUNCTIONAL RELATIONSHIPS, BUT CONSIDER SITE AND CLIMATE CHARACTERISTICS. PERMIT NATURAL LIGHTING IN SPACES USED FOR DAYTIME ACTIVITIES.



5. SECURITY CONTROLS

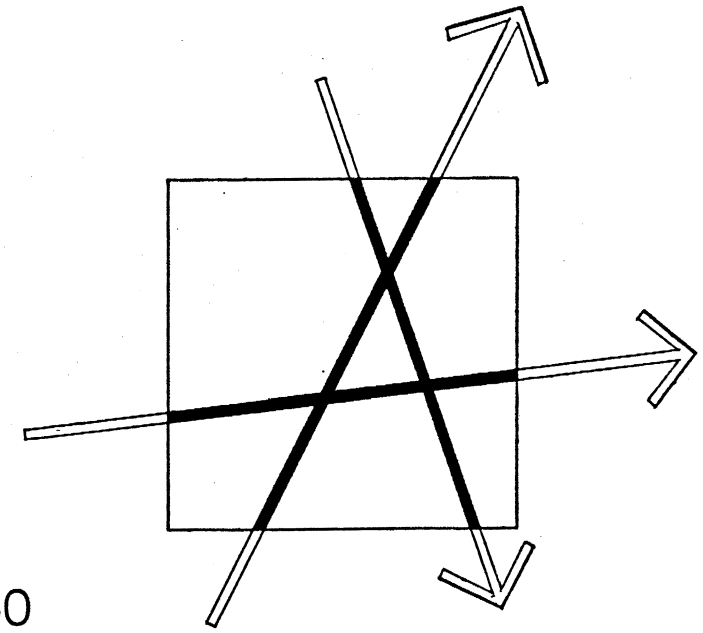
ALLOW FOR EASY MOVEMENT OF RESIDENTS AND GUESTS, BUT PROVIDE CONTROLS TO PROTECT PROPERLY.





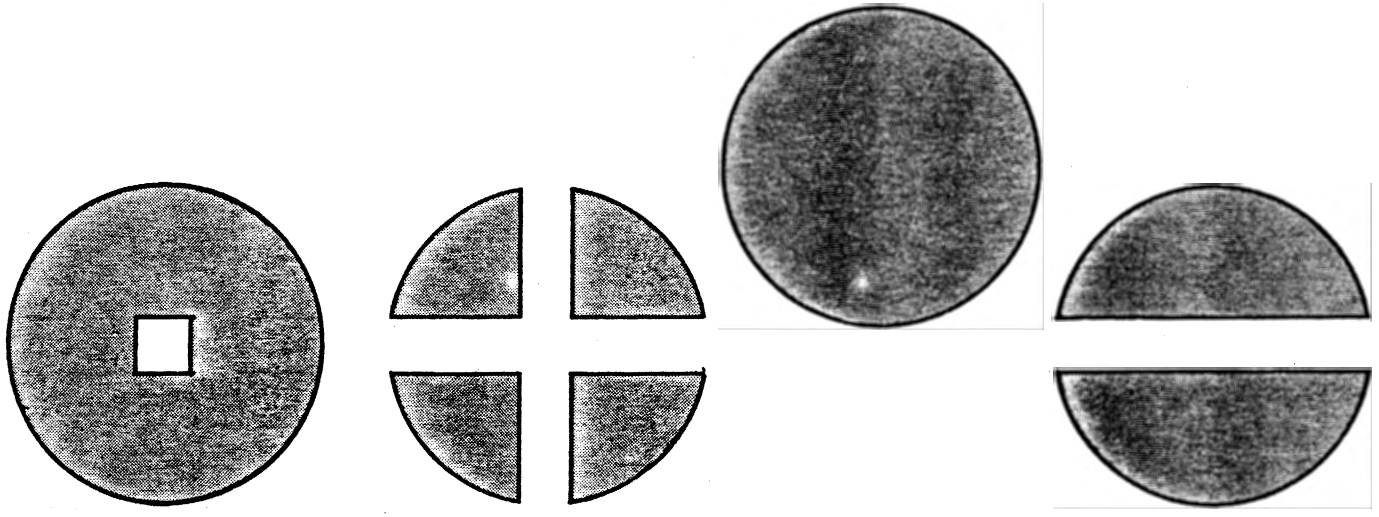
6. MIXED FLOW

FRAME THE DAILY SCENE TO BRING ATTENTION TO THE LIFE OF THE PLACE.



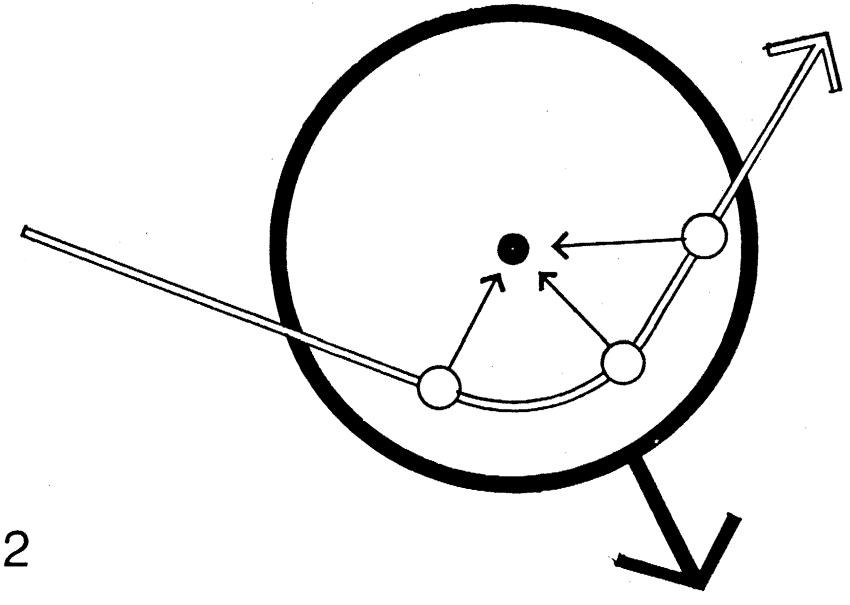
7. PASSIVE STRATEGIES

INCORPORATE BUILDING ELEMENTS AND MECHANISMS THAT ADAPT THE FACILITY TO CLIMATIC CONDITIONS.



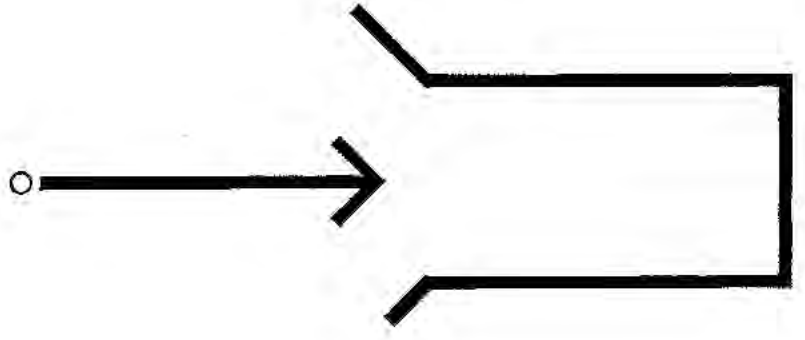
8. ORIENTATION

SINCE MANY USERS OF THE FACILITY WILL NOT BE GRADUATE RESIDENTS, PROVIDE A POINT OF REFERENCE WITHIN THE FACILITY. RELATE THE BUILDING ITSELF TO THE MAIN CAMPUS.



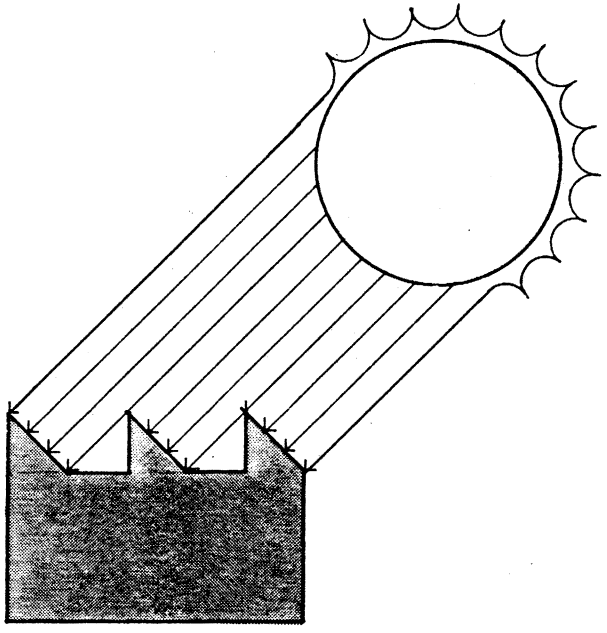
9. INVITATION

PROMOTE A SENSE OF ENTRANCE AND ARRIVAL. PROVIDE DIRECT ACCESS TO PLACES FOR MEETING AND ENCOUNTER.



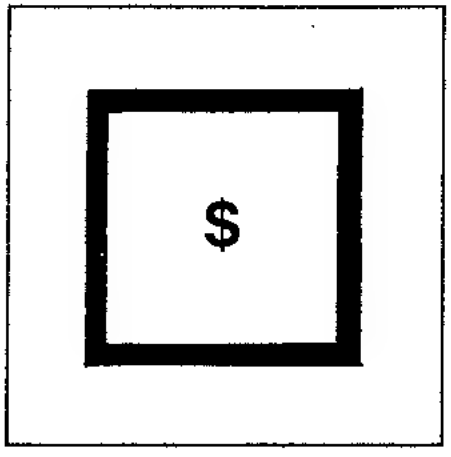
10. CHARACTER

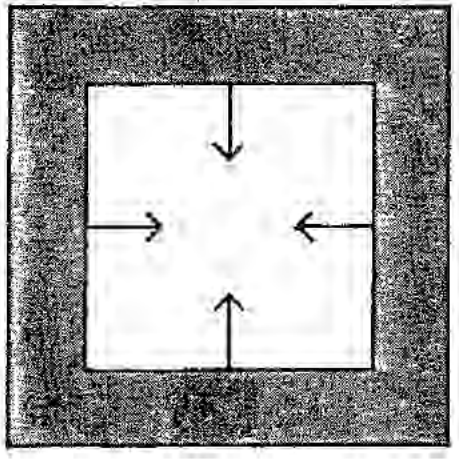
RELATE ARCHITECTURAL FORM TO PASSIVE ENERGY SYSTEMS USED IN THE FACILITY.



11. ENERGY CONSERVATION

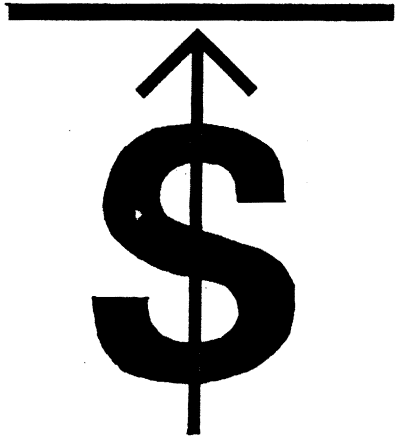
KEEP MECHANICALLY CONDITIONED AREAS TO A MINIMUM. UTILIZE THE MASS OF THE STRUCTURE AS A HEAT STORAGE MINIMUM.



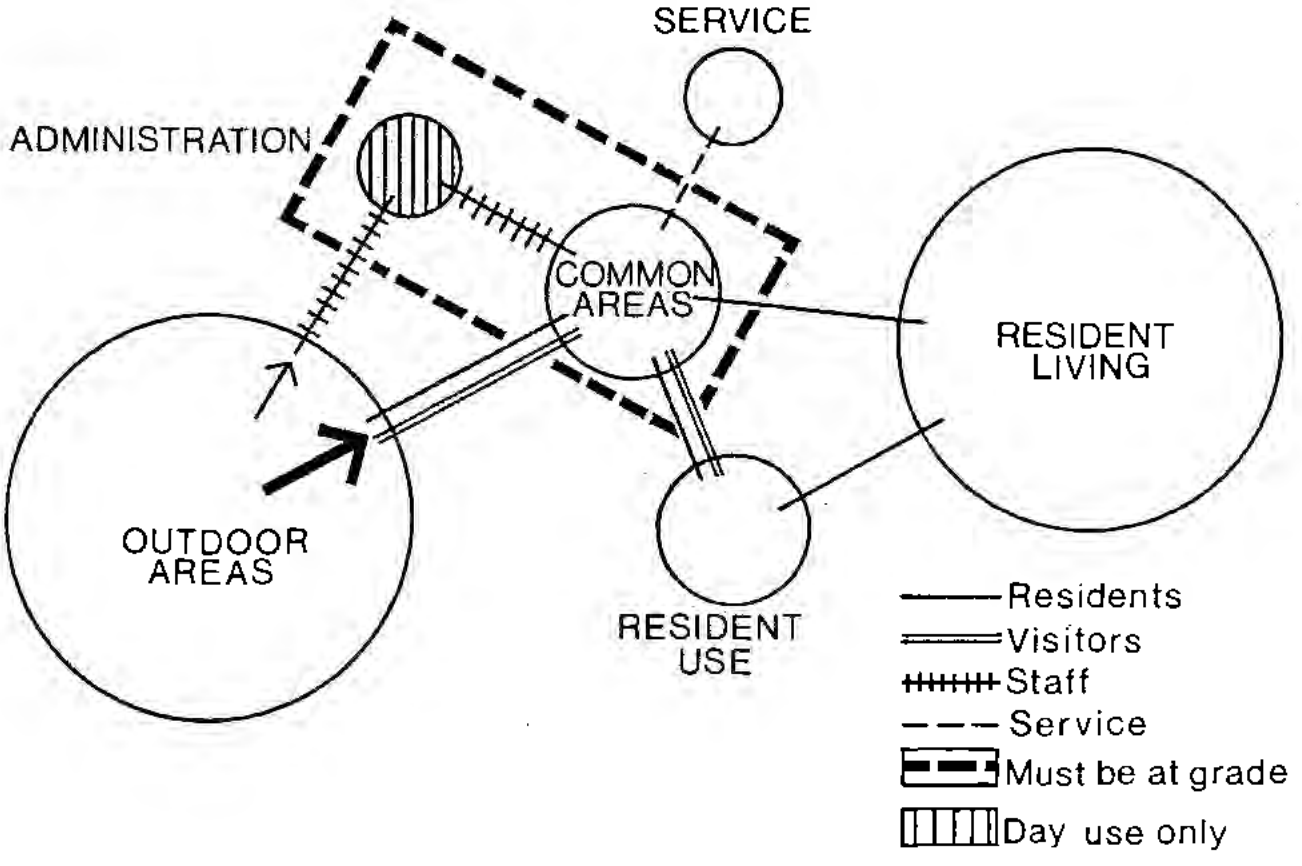


12. COST CONTROL

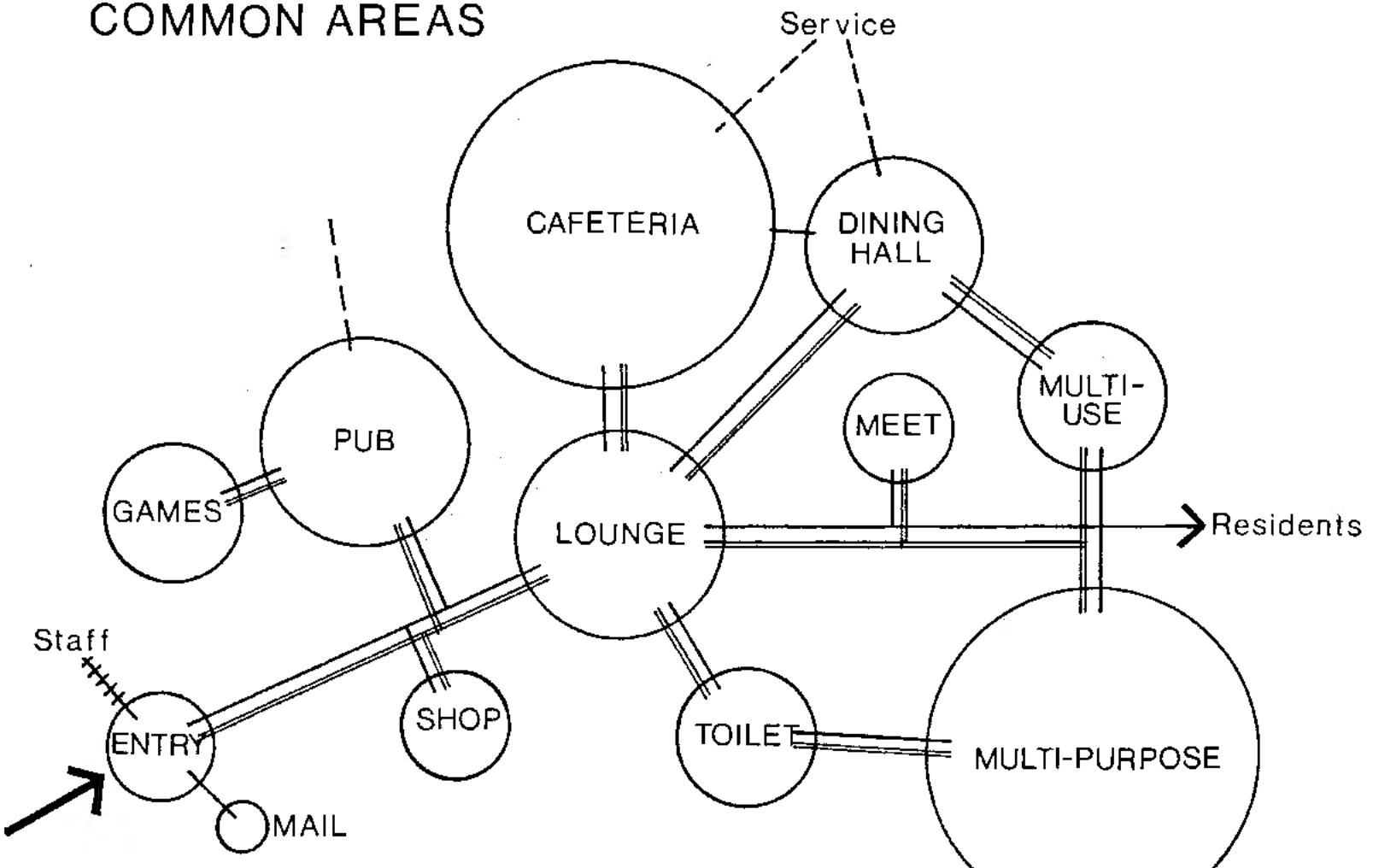
DECREASE THE DEPENDENCE ON MECHANICAL ENVIRONMENTAL CONDITIONING EQUIPMENT.



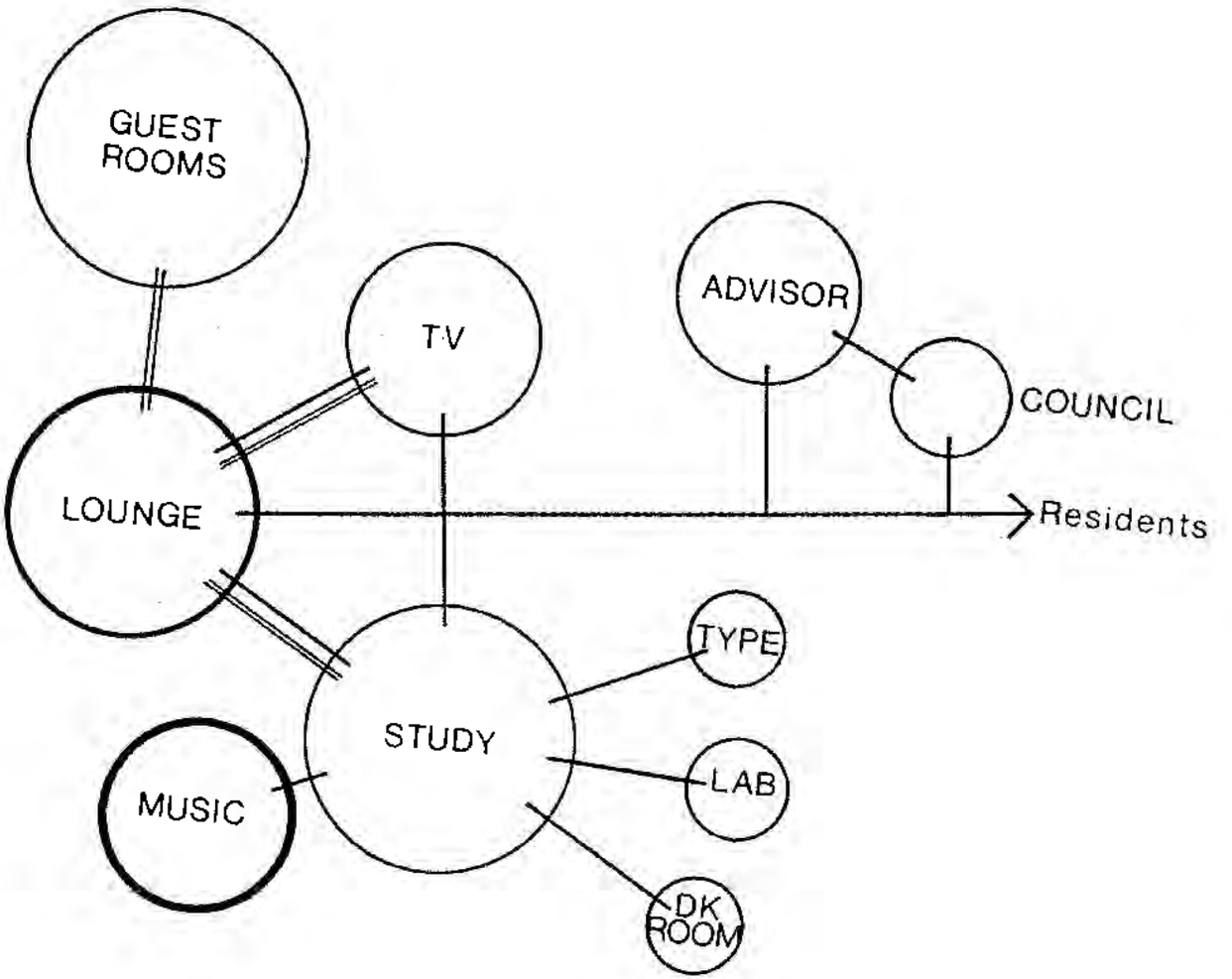
FUNCTIONAL RELATIONSHIPS



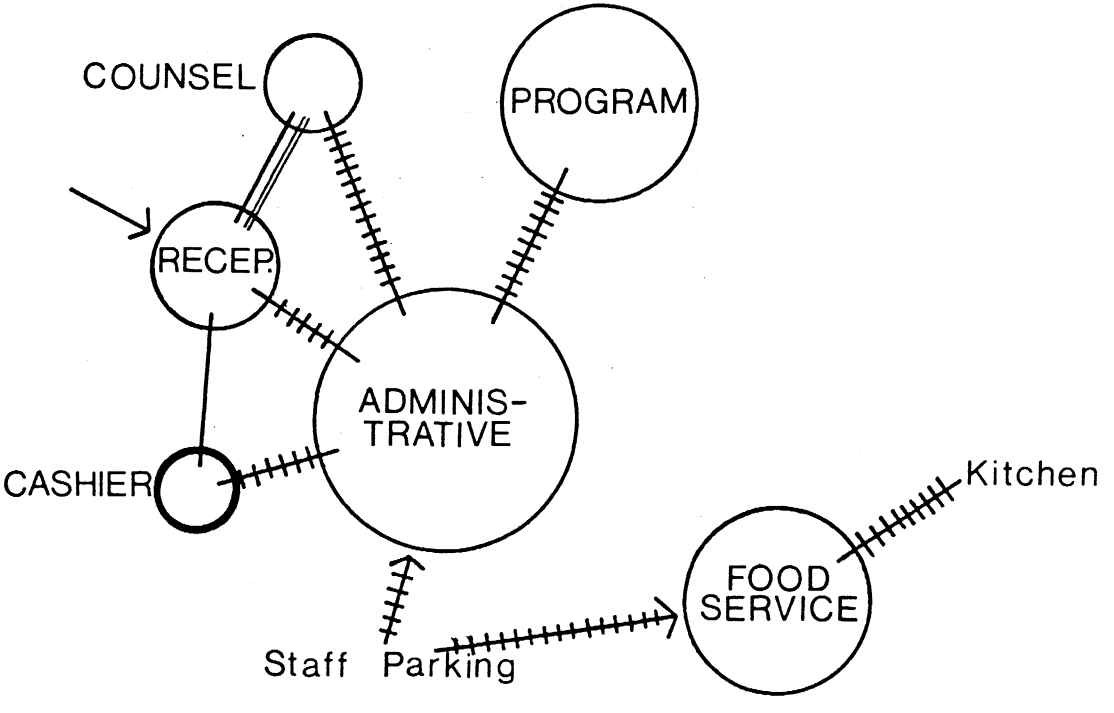
COMMON AREAS



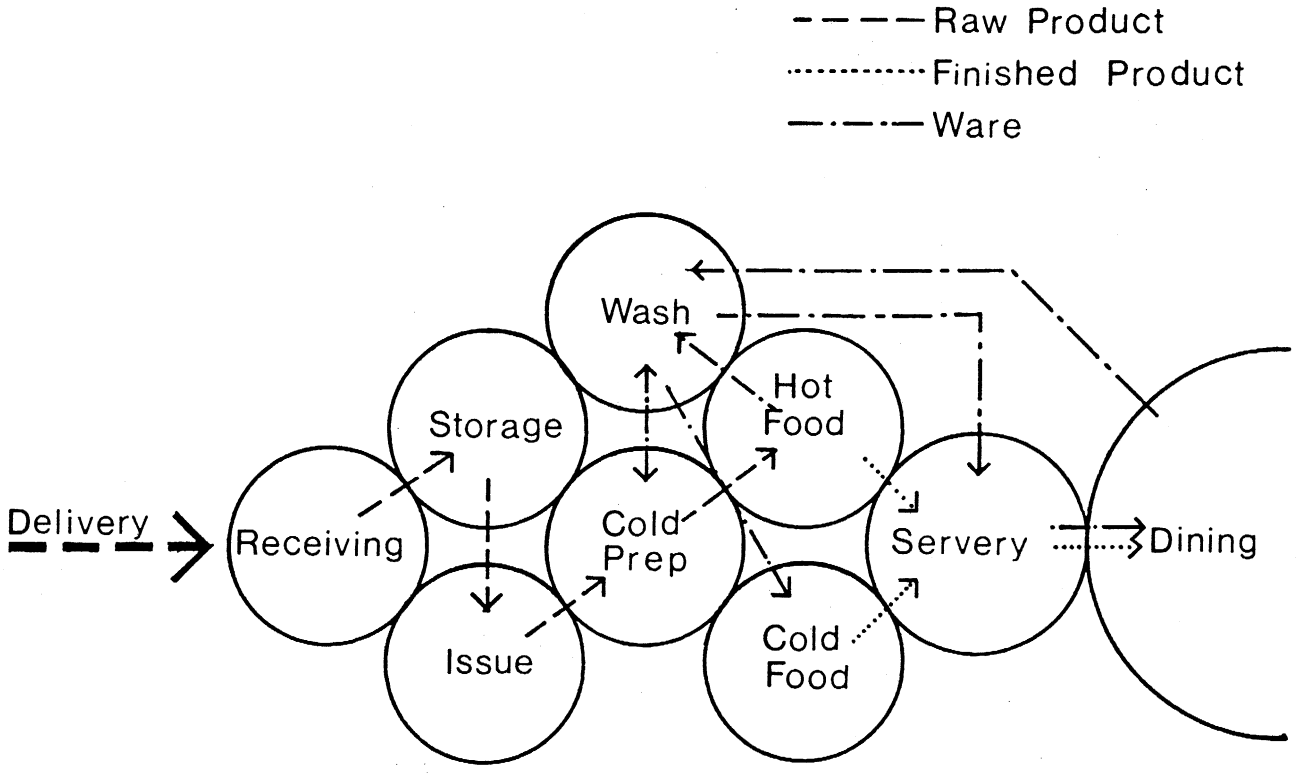
RESIDENT USE AREAS



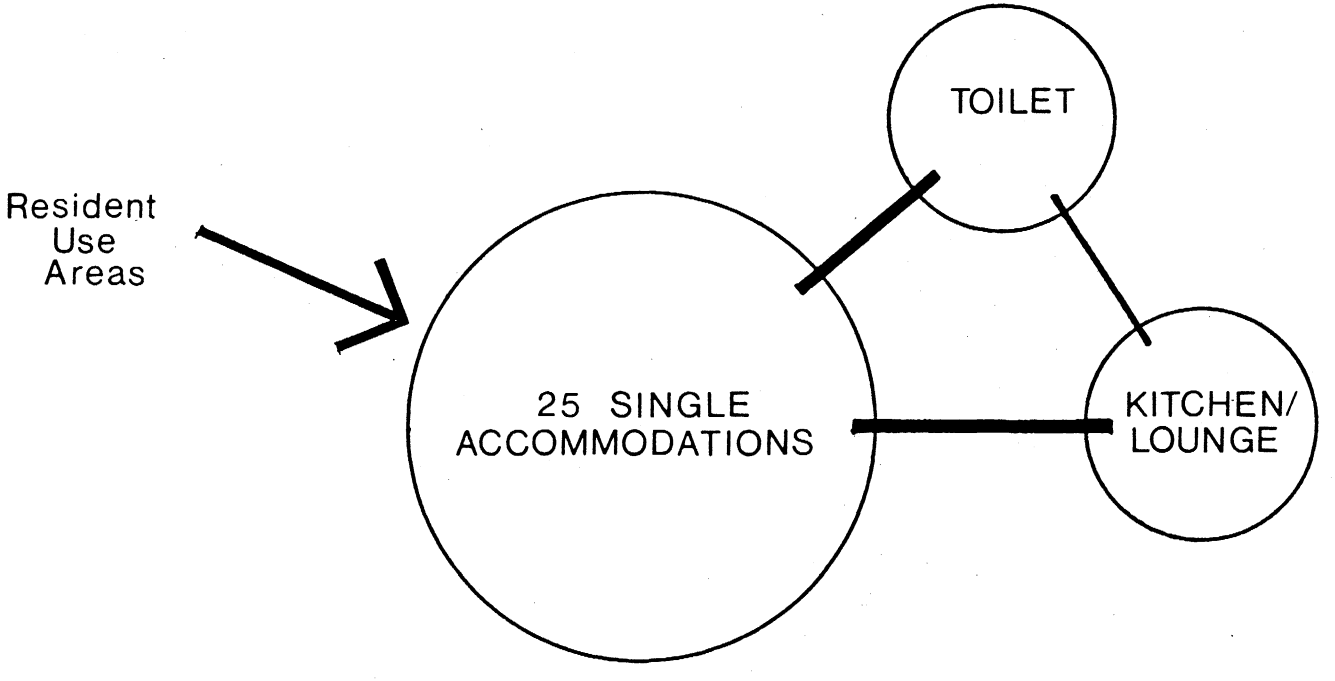
ADMINISTRATIVE/STAFF AREAS



KITCHEN AREAS



RESIDENT LIVING MODULE



NEEDS

Space Requirements

Major area categories for the graduate dormitory include the following:

Administrative/Staff Areas would accomodate the administrative, clerical and program co-ordination of the facility, as well as counseling. These areas should be located at grade level.

Common Resident/Visitor Areas. Group activities, such as dining, drinking, discussion and study would occur in these areas, which should be at grade level. Regular spontaneous meetings and small gatherings, as well as formal programs, would happen throughout this part of the facility.

Resident Living Areas. These areas would be for private activities, like studying, bathing, or sleeping. Other areas, for small groups of residents, would accommodate cooking and lounging.

Resident Use Areas. Included in this category are areas for studying, television viewing, and guest sleeping. Specialty areas would accommodate music practice, film development, and typing.

Service/Support/Storage Areas. This category explains itself. It includes food preparation, delivery of goods, disposal of waste.

Outdoor Areas would accommodate public meetings, as well as seasonal cultural events and festivals, and the daily arrival and departure of residents and visitors.

Mechanical Equipment Requirements. Due to the employment of passive energy conserving design solutions, the requirements for supplementary environmental conditioning equipment should be well below those for ordinary buildings of the same size and type. Required areas for equipment are to be determined following an analysis of the particular passive system to be used in the facility.

Common Resident/Visitor Areas

Components	Approximate net area
Cafeteria (seating for 125)	2000
Special dining hall (seating for 35)	600
Large multipurpose area (seating for 300)	2100
Small multipurpose area (seating for 60)	425
Main lounge (seating for 50)	900
Entrance, reception and waiting area (seating for 10)	250
Mailroom	50
2 small discussion/meeting areas (15 people each)	240
Pub (seating for 50)	750
Shop	250
Gameroom	500
Public Lavatories	400
Common Areas	8465 s.f.

Resident Use Areas

Components	Approximate net area
Study/reading room (for 50 people)	1200
Two television viewing rooms (each for 25 persons)	600
Resident laundry (20 users)	600
Typing room (5 stations)	150
Language laboratory (4 stations)	175
Four music practice rooms (3 individual, 1 ensemble)	600
Darkroom	150
Visitor and guest overnight rooms with private baths (4 single, 3 double)	1275
Resident council office (for 2 people)	250
Resident Use Areas	5000 s.f.

Administrative/Staff Areas

Components	Approximate net area
Cashier	100
Program offices (staff of 5)	575
Administrative office (staff of 9)	1000
Advisors' residence (couple)	500
Food service office (staff of 5)	500
Counselor office	125
Administrative/Staff Areas	2800 s.f.

Service/Storage Areas

Components	Approximate net area
Cafeteria Kitchen	1100
Goods delivery and storage	500
Waste storage and disposal	300
Supplies storage	150
Suitcase and furniture storage	500
Service/Support/Storage Areas	2550 s.f.

Resident Living Areas

Components	Approximate net area
Single accommodations (for 250 residents)	29700
10 Toilet and bathing areas (each shared by 25 residents)	7500
10 Small kitchen/lounge areas (one per 25 residents)	7000
Resident living areas	44200 s.f.

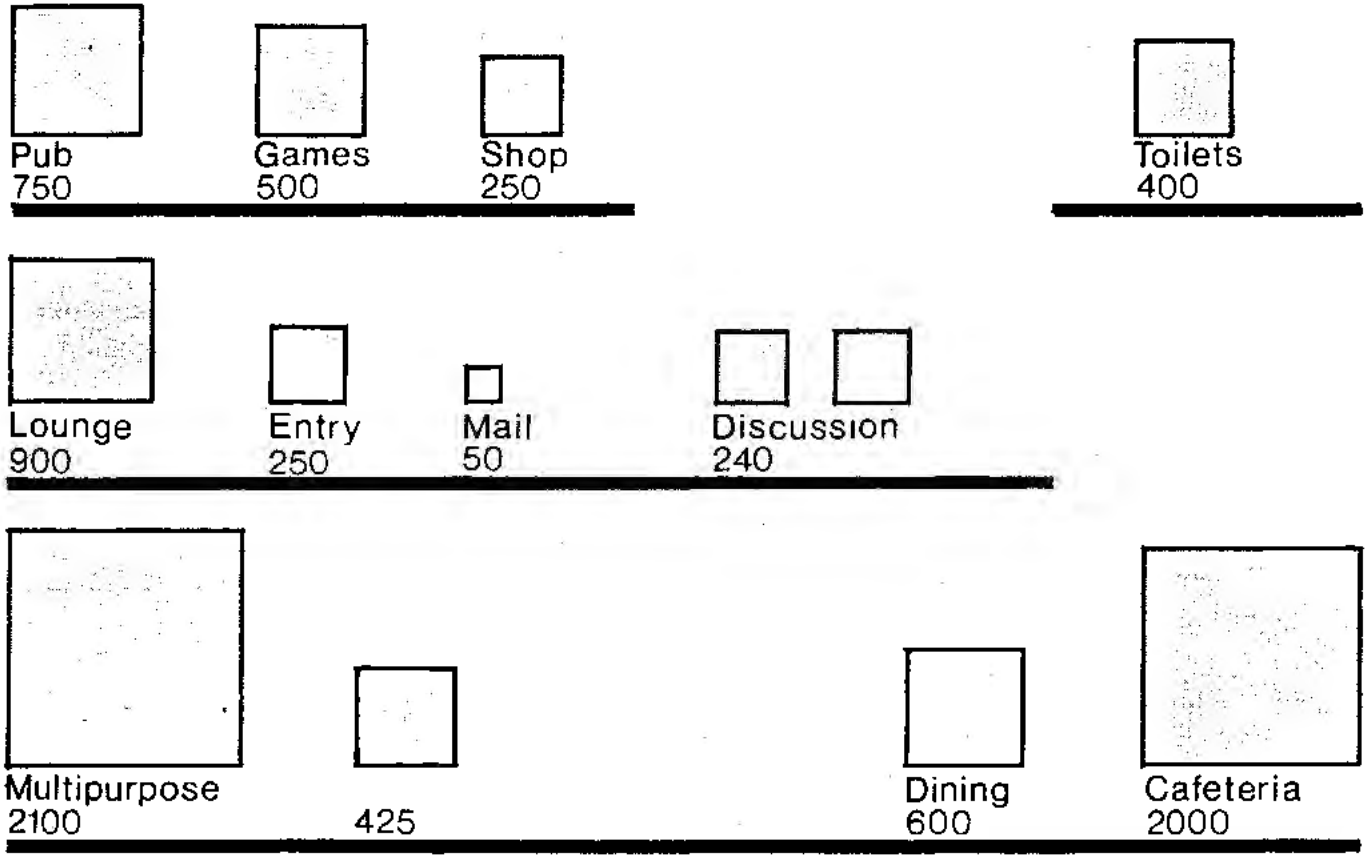
Outdoor Areas / Totals

Components	Minimum net area
Public terrace (seating for 50)	1500
Bicycle storage for 175 bicycles	2325
Outdoor areas (minimum)	3825 N.A.
Staff/advisor parking (15 spaces)	4725
Resident/visitor parking (125 spaces)	39375
Parking areas	44100 N.A.

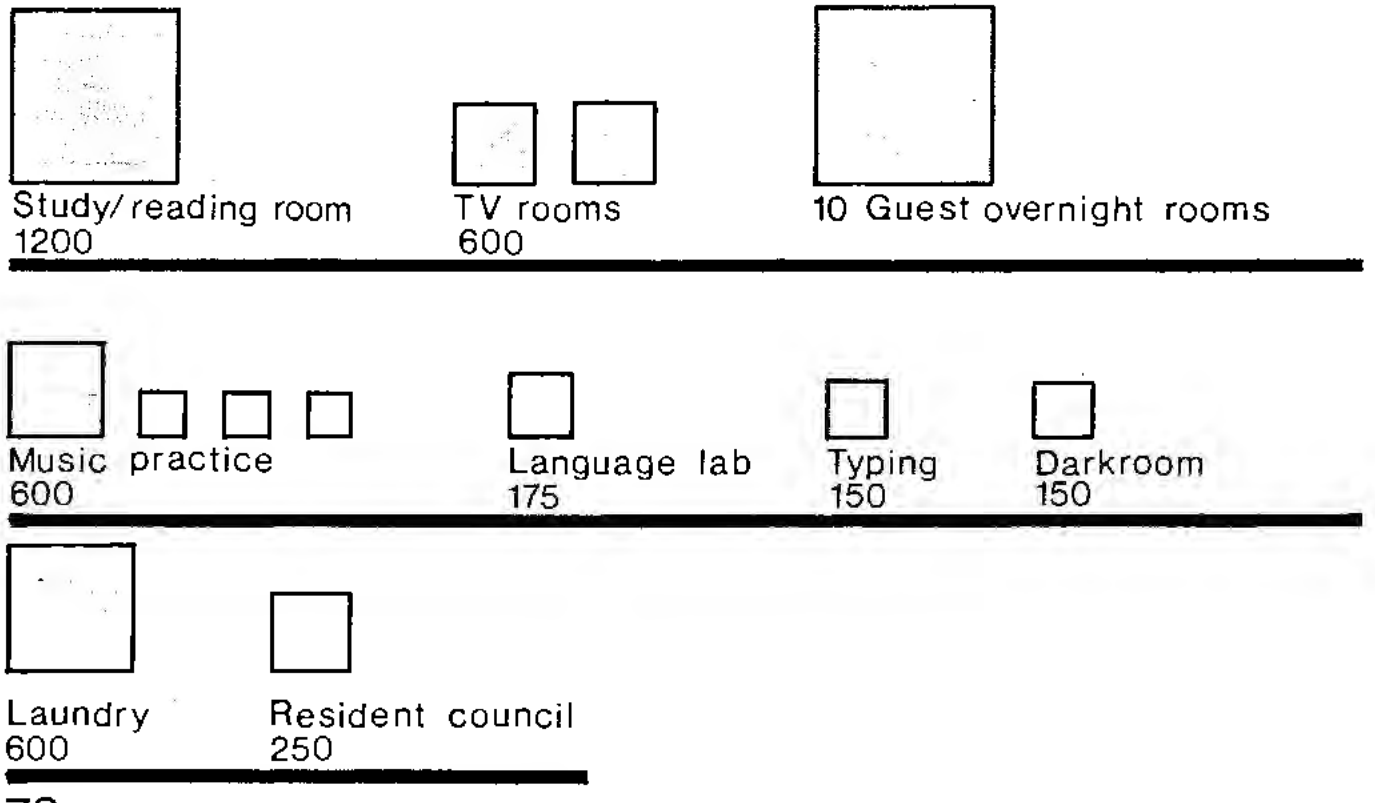
BUILDING AREA TOTALS

Grand Total Net Area	63000
60%/40% Efficiency Ratio	
Grand Total Gross Area	105000

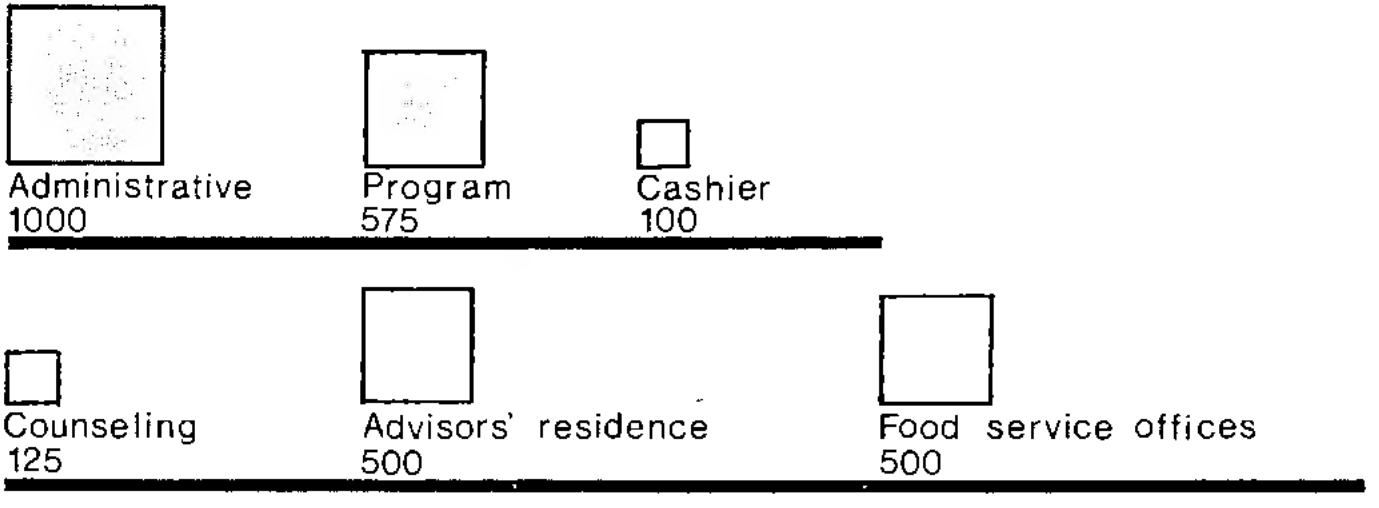
Common areas



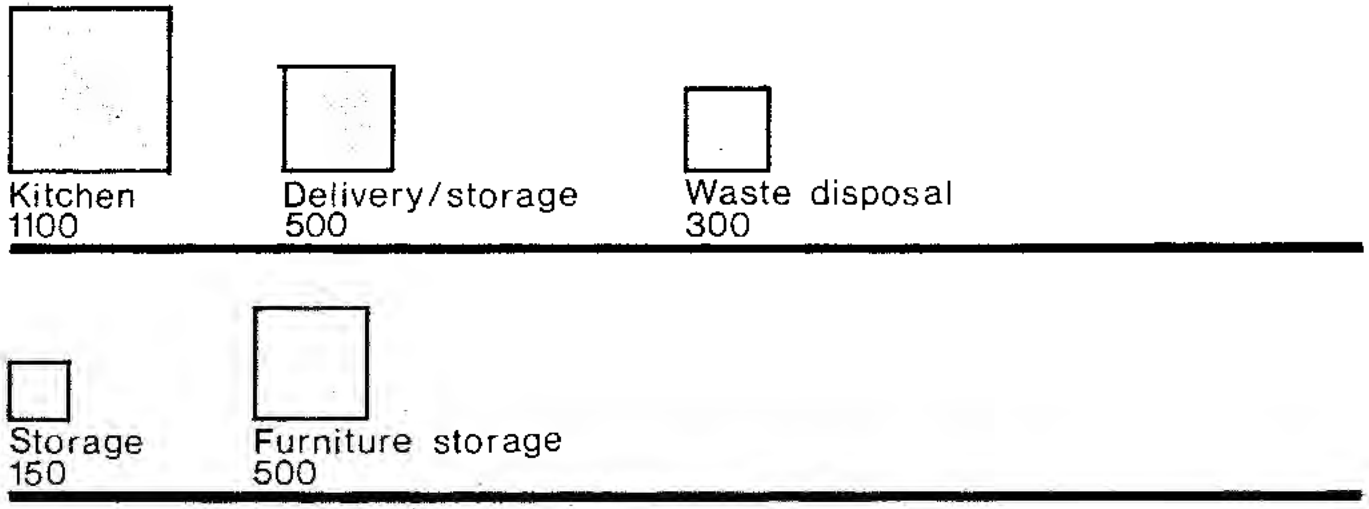
Resident use areas



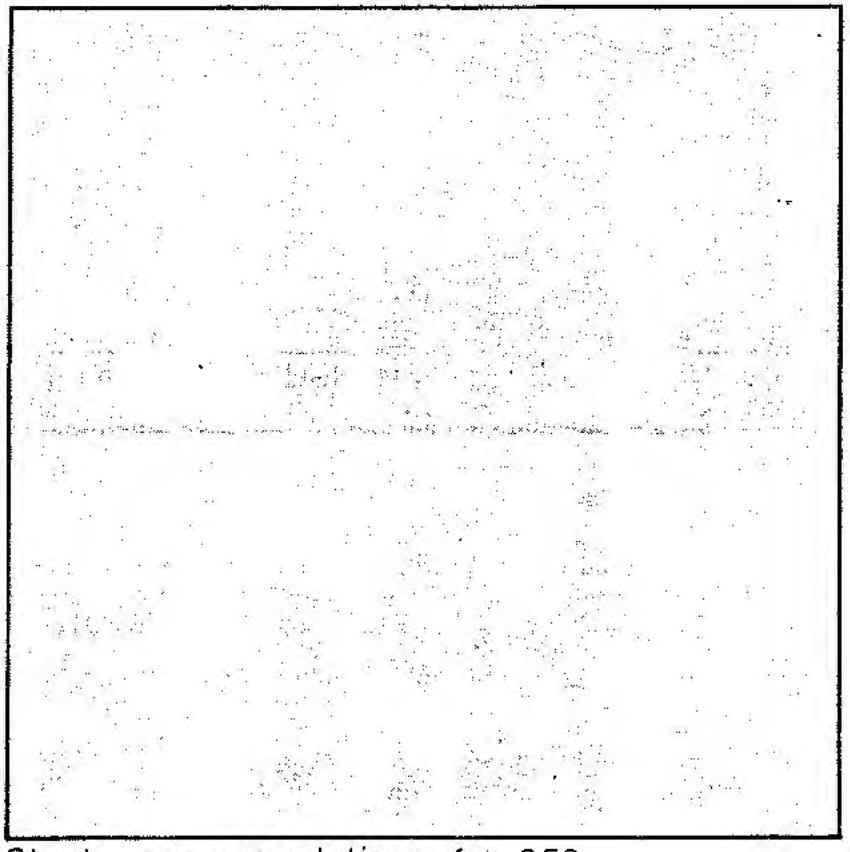
Administrative areas



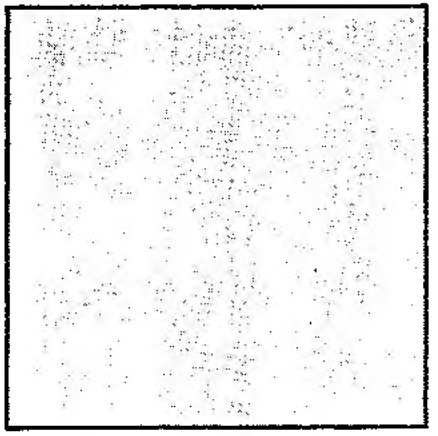
Services


Kitchen
1100
Delivery/storage
500
Waste disposal
300
Storage
150
Furniture storage
500

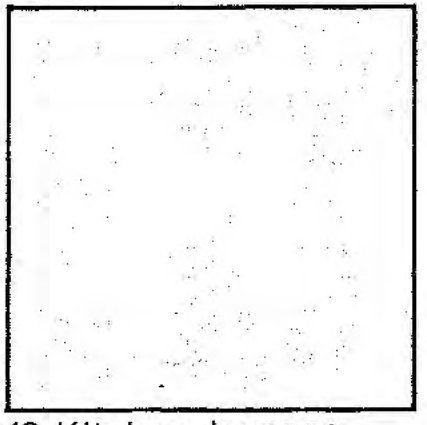
Resident living areas



Single accommodations for 250
29700

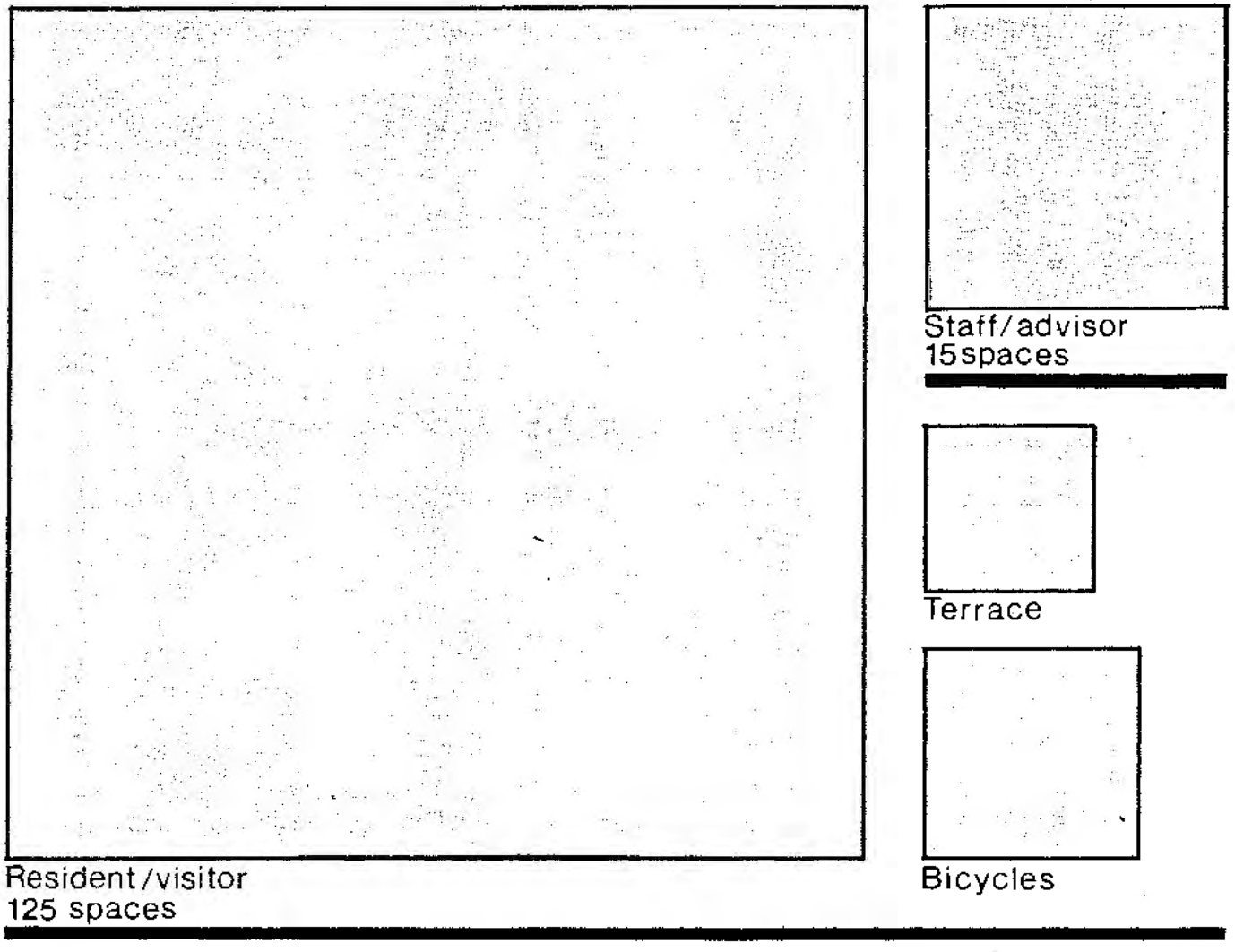


10 Toilet/bathing areas
7500



10 Kitchen-lounges
7000

Outdoor areas



New Construction Costs

Cost Estimate Analysis

A. Building Costs	105,000 S.F. at $34.00/S.F.	$3,675,000.00
B. Fixed Equipment	(10% of A)	367,500.00
C. Site Development	(10% of A)	404,250.00
D. Total Construction, excluding furnishings and fees, and demolition of existing structures.		$4,446,750.00

See appendix

PROBLEM

Function

Since the facility is to be for graduate and foreign students, the dormitory should be designed for year-round use.

Since the dormitory should provide for the total needs of the resident, the design should facilitate the unscheduled social interaction of the students as well as the scheduled educational and cultural activities.

Form

Building elements and mechanisms must adapt the facility to climatic conditions.

The facility should generate a link between American and foreign students and their cultures.

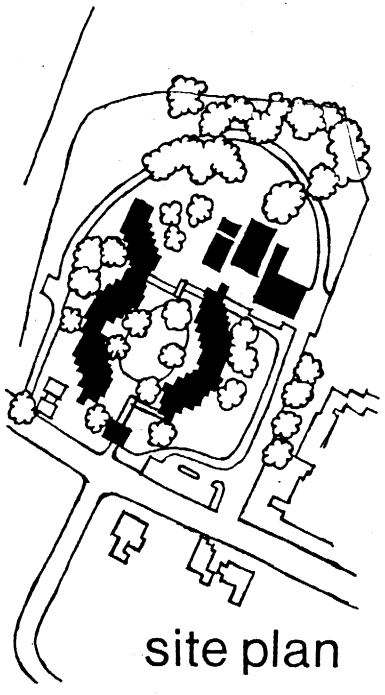
Economy

Since the dormitory is to be open throughout the year, the design of the building must facilitate lower operating costs during both the winter and summer seasons.

Materials and finishes should be considered for their effect on minimizing maintenance costs, as well as minimizing energy costs of their manufacture and transportation to the site.

APPENDIX

Evaluation of Similar Projects

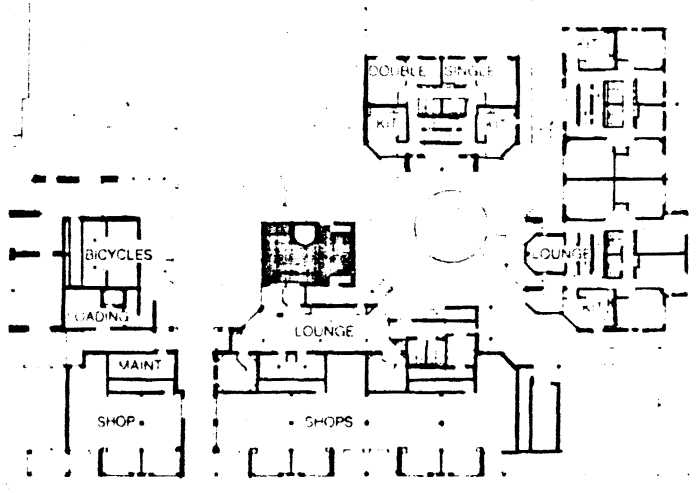


site plan

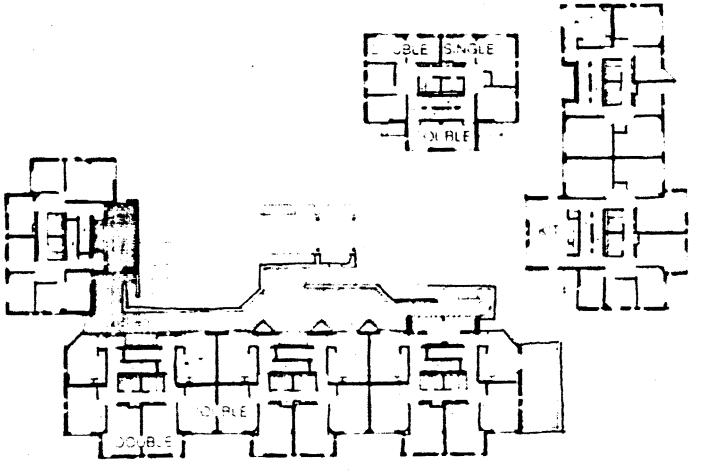
Residential Buildings, University of Reading, England.

The program called for a hall of residence, located in a very traditional suburban context, to have dining hall facilities for 300 undergraduate men. The architects felt it was important that the large numbers of study/bedrooms be broken down into manageable and identifiable groups.

Basically, the organization consists of units of 17 bedrooms to one small kitchen and amenity area. The staggered planning of the bedrooms has meant that the two opposing blocks of student rooms bend in and out and center loosely on a green. The common areas are not in the dominating, central position which they would occupy in a traditional dormitory.



FIRST FLOOR



SECOND FLOOR

Student Housing, Pembroke College, Brown University. The program called for living quarters for 196 students (60 single rooms, 68 doubles), 13 student kitchens, total gross floor area 69,000 sq. ft.--retail space and storage, 12,200 sq. ft. The site is a street corner at the edge of the University, abutting active retail on one street, large detached houses on another. Design of the Pembroke dormitories was governed by four prime considerations: building within a tight budget, providing students with choice, reinforcing the order of places adjoining the site, and bringing attention to the students who live there.

Excluding furnishings, construction cost $2,472,000, or $12,615 per resident.

Residents take possession of their own spaces and are part of a social unit small enough so that their actions and preferences count. Each unit floor has 6 to 11 students and is lockable. Within the basic building system, simple variants, such as bays, projections, window placement, and room shape have been introduced. These

variants combined with building position and outlook, make virtually every room distinguishable.

The placement of retail space at ground level along the existing retail space allowed the dormitory to be spaced quite close to the street, yet gain more privacy for the rooms above.

Paths through the complex all lead through the central courtyard. The court, with these paths and terraces that face it on the upper levels, makes a place that sharpens the perception of community--highlighting the actions and movements of people on their way to and from classes, establishing numerous opportunities for casual encounter and greeting.

Statistical Data

Fall Semester Enrollment Projections 1980-1990

	Masters	Doctors	Vet Med	Special	TOTAL
1980	1650	970	264	620	3504
1981	1660	975	270	625	3530
1982	1670	975	271	625	3541
1983	1680	975	272	625	3552
1984	1700	975	272	625	3572
1985	1700	975	273	625	3573
1986	1690	975	274	625	3564
1987	1680	975	275	625	3555
1988	1675	975	275	625	3550
1989	1650	975	275	625	3525
1990	1650	975	275	625	3525

Source: Office of Institutional Research
November 15, 1979

Fall 1979 Graduate Student Enrollment, OSU

	Married	Other	Combined
Male	1973	924	1997
Female	714	619	1333
TOTAL	1787	1543	3330

Source: Oklahoma State University
Office of the Registrar

According to the OSU Married Student Housing Office, there are 710 MSH apartments surrounding the site, approximately 213 are inhabited by foreign students and their families. This number indicates that foreign students and their families comprise 30% of the population of the immediate neighborhood.

Service Water Heating

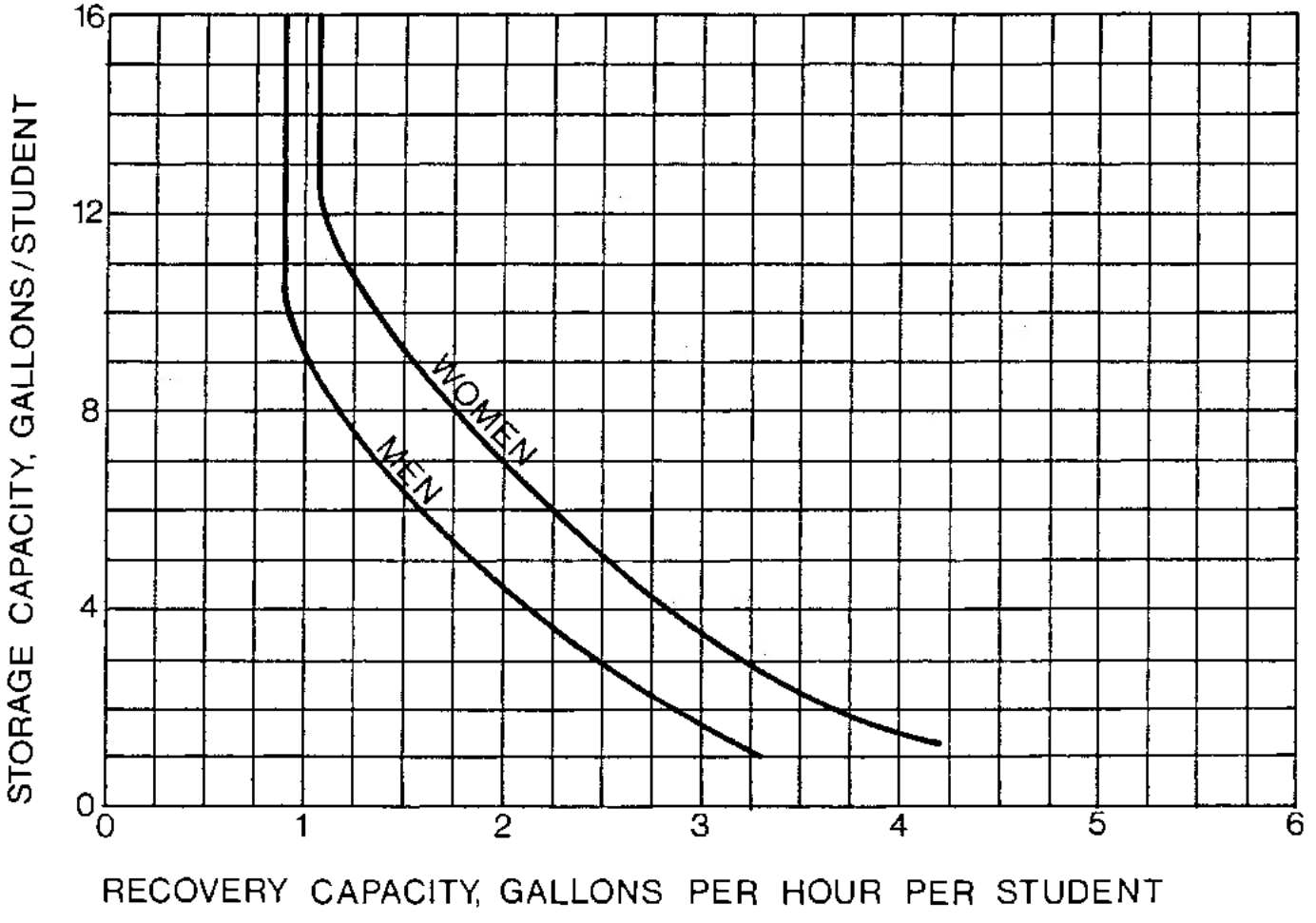
Domestic hot water requirements for college dormitories generally include showers, lavatories, slop sinks, and washing machines. Peak demand usually results from the use of showers. Load profiles and hourly consumption data indicate that peaks may last one or two hours and then turn off substantially. These peaks occur predominately in the evening, mainly around midnight. The figures do not include hot water use for food service

HOT WATER DEMANDS FOR DORMITORIES

	Maximum Hour	Maximum Day	Average Day
Men	3.8 gal/student	22.0 gal/student	13.1 gal/student
Women	5.0 gal/student	26.5 gal/student	12.3 gal/student
Composite	4.6 gal/student	24.5 gal/student	12.7 gal/student

STORAGE/RECOVERY

SOURCE: ASHRAE 1976 SYSTEMS HANDBOOK



Cost Estimation Method

Once the total net area of a project is determined, it is an easy task to arrive at a reasonable efficiency ratio and the total gross area. This area, multiplied by a realistic unit cost, will produce the estimated building cost.

Building Cost:

Net Area ÷ Efficiency Ratio = Gross Area

Gross Area x Unit Cost = Building Cost

The following building efficiency ratios are reasonable for the uses indicated, according to Problem Seeking, by William Pena.

Administration	55/45%
Student Center	60/40%
Dormitory	60/40%
Composite	60/40%

The construction quality level is represented by a unit cost per gross square foot. The unit costs typically include architectural, structural, electrical, plumbing and mechanical work, but do not include site development and fixed equipment. Due to the anticipation of significantly low requirements for environmental conditioning equipment in the building, unit costs for the facility are estimated at $35 per sq. ft.

Now, building costs can be estimated using the previous equations:

63,000 ÷ .6 = 105,000 sq. ft.

105,000 x 35 = $3,675,000.00

Fixed equipment costs are usually determined as a percentage of building costs. A good average figure for the cost of fixed equipment for this project would be 10% of building cost, or $367,500.

Site development costs also are estimated as a percentage of building cost. Development includes site preparation, parking, roadways, sidewalks and terraces, walls, utilities, landscaping and lighting, but not demolition of existing structures. For this project the re-configuration of the portion of the 400-car overflow parking lot is not figured in site development costs. The breakdown by category is as follows:

Site preparation	2% of building cost
Parking	2%
Roadways	1%
Sidewalks and Terraces	2%
Walls and Screens	.5%
Utilities	1%
Landscaping	1%
Lighting	1.5%
Total	11.0%, or $404,250.00

The total construction cost would then be the sum of the estimated building cost, fixed equipment cost, and site development cost:

$3,675,000
367,000
404,250
$4,446,250

Glossary

Architectural Programming: A process leading to the statement of an architectural problem and the requirements to be met in offering a solution. Programming is part of a complete series of operations leading to the occupancy of a completed building: (1) Programming, (2) Schematic Design, (3) Design Development, (4) Construction Documents, (5) Bidding, and (6) Construction.

Analysis: Separation or breaking up of a whole into its fundamental elements or component parts.

Research: Critical and exhaustive investigation or experimentation having for its aim the discovery of new facts and their correct interpretation.

Function: How the design product will work to do the job it is supposed to do. The performance.

Form: In programming, form refers to what you will see and feel, avoiding the suggestion of a particular design solution.

Economy: The efficient and sparing use of the means available for the end proposed. Implies an interest in achieving maximum results from the initial budget and the maximum cost-effectiveness of the operating and life cycle costs.

Time: Deals with the influence of history, the inevitability of change from the present and with projections into the future.

Goal: The end toward which effort is directed. Suggests something attained only by prolonged effort. Project goals are concerned with product.

Policy: A definite course of action selected from among alternatives and in the light of given conditions to guide and determine present and future decisions.

Mission: A task or function assigned or undertaken. A mission statement of an organization simply explains the reason for its existence.

Information: Knowledge obtained from investigation, study or instruction.

Fact: Information presented as having objective reality, truth.

Data: Factual material used as a basis for reasoning, discussion or decision.

User Characteristics: Those physical, social, emotional and intellectual qualities which typify the users and affect their behavior patterns. Common characteristics including age, sex, social class, nationality, intellectual ability.

Concept: Something conceived in the mind; idea, notion.

Programmatic Concepts: Ideas intended mainly as functional and organizational solutions to the client's own performance problems. They are general or abstract ideas generalized from particular instances.

Design Concepts: Ideas intended as physical solutions to the client's architectural problems.

Needs: Requirements; something necessary; an indispensible or essential thing or quality.

Space Requirement: Detailed listing of the amounts of each type of space designated for a specific purpose.

Building Cost: Includes all costs of construction within five feet of the building line; all items required by codes.

Fixed Equipment: Includes all equipment items which may be installed before completion of the building and which are a part of the construction contract, such as food service equipment, fixed seating, security equipment, fixed lighting, etc.

Site Development: Includes all work required which lies within the site boundary and five feet from the edge of the building, i.e., grading and fill, fencing,

roads and parking, utilities, landscape development, walks, site lighting, street furniture, and site graphics.

Total Construction: This represents the total budget for construction.

Problem Statement: A description of the critical conditions and design premises which become the starting point for Schematic Design.